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Malaria and Greek History

BY

W. H. S. JONES, M.A.

Fellow of St. Catharine's College, Cambridge
Assistant Master at the Perse School

TO WHICH IS ADDED

The History of Greek Therapeutics and the Malaria Theory

BY

E. T. WITHINGTON, M.A., M.B.

Balliol College, Oxford

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TO

MAJOR RONALD ROSS, F.R.S., C.B.

PROFESSOR OF TROPICAL MEDICINE IN THE UNIVERSITY OF LIVERPOOL

AS A TRIBUTE TO HIS LABOURS
FOR THE WELFARE OF MANKIND
I DEDICATE
"QUIDQUID HOC LIBELLI QUALECUMQUE"

PREFACE.

THIS book is an attempt to correct and develop the theory proposed tentatively in the little work *Malaria*. Put briefly, this theory is as follows. In the struggle for existence man has competed, not only with his fellow-men, but also with wild animals and disease-parasites. The fight against beasts was decided long before the historic period, but parasites have always been, and still are, formidable opponents. Whole tribes have been wiped out by plague, kala-azar and measles; and even when the disease-parasite does not win such a decisive victory, it often weakens a nation so much that the latter falls an easy victim to its healthier neighbours. Accordingly I have tried to show how malaria played a part in the decline of the ancient Greeks.

Dr. E. T. Withington tells me that the "malaria theory" explains a great difficulty in the history of Greek medicine, and upon this point he has written a short essay which appears at the end of the volume.

It may be that some readers will think that my theory cannot be true unless it be proved that malaria did not exist in early Greece. But the evil consequences of malaria are, to a certain extent, independent of the date of its introduction, although they are most severe and most obvious when a district is attacked which hitherto has been free from infection. Moreover, it is at least doubtful whether Greece was malarious in early times, and even if it was, the number of cases may not have been very great. In this connexion I should like to quote a few sentences

from a recent work by Major Ross.[1] "Suppose that the Anophelines have been present from the first, but that the number of infected immigrants has been few. Then, possibly, some of these people have happened to take up their abode in places where the mosquitoes are rare; others may have recovered quickly; others may not have chanced to possess parasites in suitable stages when they have been bitten. Thus the probability of their spreading the infection would be very small. Or, supposing even that some few new infections have been caused, yet, by our rough calculations in section 12, unless the mosquitoes are sufficiently numerous in the locality, the little epidemic may die out after a while—for instance, during the cool season. And, if the number of infected persons introduced from outside remains small, *this state of things may continue for years or centuries—the disease will fail to make headway*[2] and will die out. Now, suppose that the number of infected immigrants is suddenly greatly increased. Then much larger numbers of mosquitoes will become infected, and may in their turn infect more healthy people than the recovery rate will compensate for. Endemic cases will begin, will increase; at first slowly, then rapidly, until suddenly there will be a wide-spread epidemic."

It is my opinion that in this way malaria fell like a blight upon many fertile districts of Greece, as it almost certainly fell upon Attica in the fifth century B.C. With the increase of trade, foreigners must have entered the country with greater frequency and in greater numbers, and nothing could be more likely than that the number of infected persons so increased that a severe epidemic was the natural consequence.

1. *Report on the Prevention of Malaria in Mauritius*, p. 51. This work contains the best account I know of the way in which malaria is propagated. I wish it had appeared earlier, so that I might have used it in writing the following pages.

2. The italics are mine.

In early times malaria, if it existed at all, seems to have been slight in amount, and so not severe enough to prevent the country from reaching a high state of development and prosperity.

Many observers in all parts of the world have been kind enough to send me, unasked, much valuable criticism and information. These include Professor Edson, of Denver; Professor Celli, of Rome; Professors Savvas and Kouzis, of Athens; Dr. Cardamatis, of Athens; Dr. Genovese, of Caulonia; and Mr. Spencer Jerome, of Capri. In particular I wish to thank Dr. Otto Effertz, who has sent me a long account of his work among the Indians of Mexico. He is convinced that the destruction of the Indian races of the West Indian islands is due, not to the cruelty of the Spaniards, but to the malignity of newly imported infectious diseases. "For Europeans," he goes on to say, "malaria is, even on the coasts of Mexico, extremely mild. It practically does not exist. . . . . Yet from 50% to 90% of all Indians die from malaria, according to the official tables. On my last trip I went through several Indian villages which were passing through an epidemic of malaria, and had already lost 10% of their inhabitants, mostly children. According to my thesis, all newly introduced infectious diseases are specially malignant, and all specially malignant infectious diseases are newly introduced. I deduce from these facts that malaria is for Indians a newly introduced disease. . . . . In my opinion scientific societies ought to send out physicians all over the world with a commission to answer a ready-made interrogatory about the differences in malignity of diseases according to races and climates. This would throw much light upon history."

I have to thank many friends for help and encouragement. Mr. A. W. Spratt, Mr. L. Alston, Mr. S. Gaselee, and Dr. E. T. Withington have also helped in revising the proof-sheets.

The "malaria literature" is immense; several thousand books and articles have already appeared. So far as I know, however, no works exist dealing with the influence of malaria upon history. I trust that the short bibliography at the end of this volume contains all the most important books bearing upon the question to which I have limited my enquiry.

Modern Greek names are merely transliterated; the names of ancient towns are spelt in the way they are given in most modern histories. The Hippocratic *Corpus* is quoted with Kühn's paging, but references are generally given to Littré or Kühlewein as well. In every case I have tried to give the most approved reading.

The statistics given by the Greek Anti-malaria League are often incorrect, though not to such an extent as seriously to diminish their value. Wherever possible, they have been corrected.

W. H. S. JONES.

St. Catharine's College,
Cambridge.

ADDENDA.

WHILE this book was in the press a new volume of Transactions (1908) was published by the Greek Anti-malaria League. It contains much fresh information, including an account of the malarious condition of Crete (pp. 506 foll.) and a detailed list of Greek marshes (pp. 544—553). From the statistics now published it is plain that my calculations on p. 12 only give roughly the relative unhealthiness of the Greek towns. The mortality tables upon which I based my conclusions give the census of 1896; the new volume (p. 556) states that in 1907 the populations of these towns were:

Athens	174,430	Volo	23,563
Piraeus	74,583	Larissa	18,014
Patras	37,724	Zante	13,580
Syra	17,809	Calamata ...	15,397
Triccala	18,132	Pyrgos	13,690
Corfu	29,032	Tripolitza ...	10,789

On p. 150 is made the interesting statement that the inhabitants of the malarious districts of Tritaea are lazy and sluggish.

At a conference held at Liverpool University on January 25, 1909, it was asked by what route malaria entered ancient Greece. There were so many possible ways that I have refrained in this book from discussing the question. I would remark, however, that malaria might very well creep in quite unobserved. See North *Roman Fever*, p. 66.

CONTENTS.

INTRODUCTION.

MALARIA is caused by a multitude of minute animal parasites, which, developing at the expense of the red blood corpuscles of their human host, produce attacks of fever at definite intervals.

These parasites are of four kinds:—

(1) The *quartan*, causing a fever which lasts about nine hours and recurs every third day.

(2) The *mild tertian*, causing a fever which lasts eleven hours and recurs every other day.

(3) The *malignant tertian*. The fever may last for forty hours. The temperature rises slowly, halts, declines a little and then rises again to a still greater height; finally it falls. The attack recurs every other day.

(4) The *quotidian*, causing a fever which lasts from six to twelve hours and comes on every day.

A quotidian fever, however, besides being the result of one generation of quotidian parasites, may be produced by either (*a*) three parallel generations of quartan parasites, or (*b*) two parallel generations of tertian parasites. There may be also mixed infections due to different parasites together, and double quartans.

The malarial attack is divided into three stages—(1) the cold stage; (2) the hot stage; (3) the sweating stage.

(1) The attack begins with a feeling of nausea and weariness. The head begins to ache and the patient shivers. There is a reduction of the skin temperature accompanied by internal fever. The pulse is quick, small and hard.

(2) The skin becomes hot and red, the pulse full and bounding. Thirst is intense. Delirium is sometimes present.

(3) In this stage there is more or less sweating, followed by cessation of fever and even by sleep.

This is the normal course of a malarial attack, but there are numberless variations. The most common is the hot stage alone, the first and last stages being scarcely noticeable. Very often the fever does not intermit at all, but merely declines more or less on certain days or at certain hours. The result is remittent malaria. Not seldom, especially in mixed or double infections, the fever is practically continuous. Some of the irregular forms of malaria are very hard to distinguish from typhoid; microscopic examination is the only reliable means of diagnosis.[1]

If not treated with quinine, which has great power to kill the parasites, the disease will cause frequent relapses of fever, anaemia and enlargement of the spleen. In some cases the parasites may remain in the body for years, and fever result whenever exceptional strain—over-fatigue or chill—has to be undergone.

[1] Modern Greek physicians divide the forms of malaria into the following classes:—

(1) Intermittent fevers (*διαλείποντες πυρετοί*): (*a*) quotidians (*ἀμφημερινοί*); (*b*) tertians (*τριταῖοι*); (*c*) quartans (*τεταρταῖοι*).
(2) Remittent fevers (*ὑφέσιμοι πυρετοί*). These are sometimes called "sub-continuous" (*ὑποσυνεχεῖς*).
(3) Pernicious fevers (*κακοήθεις πυρετοί*).
(4) Blackwater fever (*αἱμοσφαιρινουρικὸς πυρετός*).
(5) Chronic malaria (*χρόνιοι ἑλώδεις πυρετοί*).
(6) Malarial cachexia (*ἑλειογενὴς καχεξία*).

Pernicious fevers (which may have a quotidian or tertian periodicity are subdivided into groups according to their clinical forms. Some latitude seems to be permitted as to the names employed but the most common are:—

(1) Comatose (*κωματώδεις*).
(2) Algid (*παγετώδεις*).
(3) Gastric (*γαστραλγικοί*).
(4)4Hyperpyrexial (*ὑπερπυρετικοί*).
(5) Convulsive (*σπασμωδικοί*).

The malaria parasite is carried from man to man by Anopheline mosquitoes. It is therefore clear that a knowledge of the life and habits of this group is of great importance.[1] Especially is this the case in estimating the prevalence of malaria at a time when statistical records were impossible.

The mosquito lives in water during the stages of egg, larva and nympha; as a perfect insect its life is passed in the air.[2] The eggs are deposited by preference in stagnant or almost stagnant waters. Shallow pools, the margins of streams, in fact any surface water that is not disturbed by currents or otherwise, may serve as a breeding-ground. The movement of water is hostile to the life of larvae. These facts explain why malaria is most common in marshy districts, and why it disappears when the land is properly drained. Cultivation of the soil, if it diminishes the number of surface puddles, tends to lessen the amount of the disease; if, on the other hand, it requires the partial flooding of the soil, as is the case with rice, the disease will increase as more and more land is brought under cultivation.

Winged mosquitoes during the day-time live in woods, cellars, caves and other dark, damp places. In the evening they leave these haunts and feed on the blood of man and other animals. Hence it is dangerous to remain in the open after sunset, because the Anophelines are thus given a better opportunity of biting. Woods near marshy land are dangerous, because they shelter mosquitoes during the day; woods on hills are a great

[1] Manson and Celli, with most other authorities, admit that there may be other modes of propagating malaria. This view is vigorously defended by Prof. G. Viola in the Italian medical journal *il Tommasi* (Nos. 35, 36 of 1907 and 1, 2 of 1908). As far as our knowledge goes, propagation by Anophelines is the only method of transmission that has been scientifically demonstrated. There may be other, as yet unsuspected, modes of infection.

[2] In this part of the chapter I am deeply indebted to the work of Celli.

advantage, because when thus situated they help to prevent mountain-torrents from flooding the valleys below. The malaria mosquito cannot fly very far in any direction; hence the disease is, in a special sense, a local one, and attaches itself to particular districts.

That malaria and marshes are intimately connected was noticed by Hippocrates, but no effort appears to have been made to explain scientifically this connexion until the eighteenth century. In 1717 Lancisi laid the foundation of subsequent investigation by his book *De noxiis paludum effluviis, eorumque remediis.* Later in the same century two Englishmen, Pringle and Lind, made valuable contributions to the study of the disease, an example which has been worthily followed ever since by physicians serving in the British Army. France also has representatives in Faure, Maillot, Boudin and many others; and it was the Frenchman Laveran who in 1880 first discovered the malaria parasite. His work was extended by Golgi, Celli and Marchiafava, and when Manson and others suggested, and Ross proved, the part played by the mosquito, the Italian school again came to the front with Grassi, Bignami and Bastianelli, who showed what species of Anophelines in Italy can communicate to man the malaria parasite.

Malaria in Greece did not attract much notice before the War of Independence. Macculloch,[1] writing in 1827, speaks of the devastation caused by it, and in 1829 Roux published his *Histoire médicale de l'Armée française en Morée.* The work of Faure, *Des Fièvres intermittentes et continues,* published in 1833, contains some remarks referring to Greece,[2] and under the year 1839 we find chronicled Thomann's *Ueber die Wechselfieber in Griechenland.* It was the experience of foreign troops in Greece that caused Littré, whose great edition of

[1] It was Macculloch who introduced into the English language the word "malaria."

[2] See pp. 47 foll.

Hippocrates appeared between 1839 and 1861, to identify the fevers of the *Epidemics* with the remittent fevers of modern Greece. Part was taken in the discussion to which Littré's book gave rise by Fuster and Conradi. Many papers, dealing with various points in connexion with malaria, have appeared in the Greek medical journals during the last fifty years. The histories of medicine by Häser and Daremberg contain much valuable information about malaria in the ancient world, and Hirsch's work on historical and geographical pathology (1881) describes accurately the malarial condition of Greece as it was then known. In 1884 Stéphanos published *La Grèce au point de vue naturel, ethnologique, anthropologique, démographique et médical* as part of the *Dictionnaire encyclopédique des Sciences médicales*. Stéphanos took great pains to secure trustworthy helpers in collecting his materials, and even now his book is indispensable. The discovery of the manner in which malaria is spread gave a new impetus to study; and, encouraged by the hopes now held out of combating the disease, a Greek League for the suppression of malaria was founded in 1905. Major R. Ross, who visited the country in 1906 to investigate the malaria on the Copaic plain, has done much to explain to the public [1] at home the work that is being carried on; and, finally, in 1907 appeared Ἡ ἑλονοσία ἐν Ἑλλάδι, the official record of the League for the first two years of its existence. In it there was published a paper by Prof. A. Kouzis, which was the first attempt to trace the history of malaria in Greece from the earliest times to the present day, and Dr. Cardamatis discussed the same question with special reference to Athens.

The peculiarly evil consequences of malaria have

[1] How much this was needed can easily be seen by a glance at the meagre chapter on Greece in A. Davidson's *Geographical Pathology* (1892).

been at all times acknowledged.[1] So far as I am aware, however, there was no systematic treatment of the question before Cabanis, who in 1815 published a work of which one section deals with the influence of intermittent fevers upon the character of the patient. This, it is plain, is but a small part of a much wider subject. Macculloch was deeply impressed by the mischief that malaria causes, and his book, which is concerned chiefly with this and kindred topics, is marked throughout by a philosophic range of view and by thorough familiarity with the facts as they were known in his day. Subsequent discussion has been practically limited to *obiter dicta,* although these, *e.g.,* the remarks in North's *Roman Fever* and Celli's *Malaria,* are often of the highest value.

During the last fifty years there has existed a tendency to regard the seriousness of the damage done by malaria as of less account than it appeared to previous investigators. I am not aware that any definite statement has been made to this effect; but writers have concentrated their attention on the cause and treatment of the disease rather than on its consequences. Two reasons for this change of view stand out prominently. In the first place, older writers often include under malaria many other fevers; Macculloch, for instance, attributes to it much suffering and loss which he should have assigned to enteric. Throughout the history of tropical disease, as knowledge increases, enteric comes more and more to

[1] The ignorant, and those who have experience of mild malaria only, sometimes are, or pretend to be, indifferent to it. The consequences of malaria are, in the long run, far worse than those of typhoid. The latter usually comes in epidemics, and either kills the patient or leaves him practically immune; malaria is usually endemic, poisons whole regions, and leaves the patient more susceptible to another attack and to other diseases. Besides causing decline, malaria may hasten the desertion and prevent the re-cultivation of large tracts (*e.g.,* the Campagna) which may have been neglected originally for other reasons.

the front.[1] Secondly, the wider adoption of rational treatment has made the disastrous results of malaria less conspicuous. Williams,[2] writing in 1841, notices that "the modern mode of treatment . . . . has so greatly diminished the severity of the paroxysm, that these symptoms (coma, delirium) are rarely observed." Although Peruvian bark was tried medicinally in Spain as early as 1639,[3] yet its employment in fevers to which it is unsuited, and especially ignorance of the proper form and manner in which it should be administered, led to its discredit even among some of the medical profession; while the poor throughout Europe clung to quack treatment[4] within the memory of middle-aged men.[5] Dr. Genovese, of Caulonia, writes to tell me that fifty years ago the lower classes of Italy used to take pills of soot or cob-web, while the old physicians used quinine timidly, without judgment and in small doses, relying

[1] This may be illustrated from quite recent writers. Thus Stéphanos in 1884 says (*La Grèce*, p. 503): "Dans la Grèce actuelle, d' après la plupart des médecins du pays, la maladie est en général rare, sur quelques points seulement est elle plus ou moins fréquente. La majorité des médecins assurent qu'ils ne l'ont observée d'une manière incontestable que rarement." Yet during the year 1907 there were, according to the mortality tables, 93 deaths in Athens, 60 in Piraeus, 19 in Patras, 16 in Syra, 6 in Triccala, 8 in Corfu, 9 in Volo, 11 in Lariśsa, 6 in Zante, 11 in Calamata, 11 in Pyrgos, and 6 in Tripolitza, from κοιλιακὸς τύφος ἢ τυφοειδὴς πυρετὸς (καὶ γαστρικὸς πυρετός). In country districts the disease may be less common; no information is available.

[2] *Elements of Medicine*, vol. ii., p. 489.

[3] See Creighton, *History of Epidemics in Britain*, vol. ii., pp. 320 foll.

[4] I am told by Mr. T. B. Bumpsted, of Trumpington, that port-wine and opium were the favourite remedies among the Fen people. These may have been of some use, and quinine was certainly valued as a specific for ague. See *The Journal of Hygiene*, vol. i., no. 1; *Studies in Relation to Malaria* by Drs. Nuttall, Cobbett, and Strangeways-Pigg, p. 40.

[5] It is not by any means extinct.

chiefly upon blood-letting. Much improvement has taken place of late, although ignorance still abounds, and, in Greece at least, the quinine that is sold to the poor is much adulterated.[1]

Eighty years ago Macculloch complained of the great indifference displayed by Englishmen to the damage caused by malaria. The same complaint holds good to-day, in spite of the immense importance of the question to our colonies and dependencies. Many parts of Africa and India are scarcely habitable owing to the prevalence of marsh-fever. Yet now, if ever, is the time for vigorous action. The discovery of Ross has made it possible greatly to diminish if not altogether to banish the disease, and it is with the hope of arousing interest that I have ventured to estimate the part played by malaria in the history of one of the greatest nations of antiquity.

[1] Recent legislation may remedy this.

CHAPTER I.

Malaria in Modern Greece.

The present malarious condition of Greece is a fair indication of the state of the country in classical times. The surface of the land has changed to a certain extent, and without doubt the amount of malaria has fluctuated greatly; but, nevertheless, a comparison of the two epochs brings out, amid some differences, a remarkable similarity. If due care be taken, the gaps in our knowledge of the classical period may be supplied by well ascertained facts about modern Greece.

At no time has the enquirer had better or more abundant material at his disposal. The earlier attempts to ascertain the prevalence of malaria in the country, however careful and conscientious, were very imperfect, owing to the amount of research and the number of collaborators required. But the work of Hirsch and Stéphanos is now superseded by the laborious compilations of the Greek Anti-malaria League. This society, founded on the model of similar institutions in Italy and elsewhere, came into being at the beginning of the year 1905, just before a severe epidemic of malaria broke out.

The work of the League is roughly as follows. In the first place, it is necessary accurately to estimate the prevalence of the disease throughout the country. Before the League began to collect evidence, the only available records were the statistics of various hospitals and the mortality tables of the twelve largest Greek towns. As country districts are, generally speaking, far more malarious than cities, much careful enquiry is necessary before the extent of the work to be done by the League

is exactly known. Reports have been sent to Athens by many country physicians, but this part of the work of the League is not yet complete.

The education of both the laity and the medical profession in the new discoveries, which have made it possible to stamp out malaria, is another necessary yet very difficult task. The physicians, being well trained and highly intelligent men, are ready enough to keep abreast of the times; but among the people, who, of course, must work out their own salvation, ignorance, stupidity and indifference are rife. Accordingly lectures are being given, circulars distributed to suitable persons, and notices put up in public places; every means that experience suggests is being employed to the utmost.[1]

To fight malaria successfully and speedily requires a combination of two methods of procedure—(*a*) the draining of the marshes or the extermination of the Anophelines; (*b*) the killing, by quinine, of the parasites in the blood of infected persons. In theory either method, thoroughly applied, would exterminate the disease, but in practice it is found necessary to employ both. To dry up the marshes around the large Greek lakes involves

[1] The general objects of the Greek Anti-malaria League may be seen from the second article of its constitution :—

"The League shall strive to attain its object :—

"(*a*) By popularising what is known of the origin, transmission, prevention and treatment of malarial diseases.

"(*b*) By the study of these diseases and of the conditions under which they spread.

"(*c*) By the preparation of suitable legislative or other measures pertinent to the object of the League, to be submitted to the Government.

"(*d*) By the application of the means pointed out by science of suppressing malaria.

"(*e*) By enquiry into the various means that further the object of the League.

"(*f*) By the distribution of rewards to those who carry out studies relating to the mission of the League, and to those who discover means or successfully apply measures furthering the prosperity thereof."

engineering difficulties which may be overcome in time; but the removal of the small puddles and ditches, caused by imperfect irrigation or the drying up in summer of mountain-torrents, is a much easier task.[1] Even when this procedure is not feasible, to cover the surface of stagnant water with oil or other suitable substance is sufficient greatly to diminish the number of mosquitoes.

The distribution of quinine is a serious difficulty. The poor often cannot afford to buy it, and even when they can, its purity is very uncertain, as unscrupulous tradesmen are in the habit of selling a mixture that contains but little quinine. A Government monopoly seems to be the only way out of a most unsatisfactory position.[2]

The highly malarious condition of Greece may be seen from a few statistics. The following are the deaths from malaria in the twelve largest towns for the years 1905, 1906, 1907:—[3]

	1905.	1906.	1907.
Athens	57	51	71
Piraeus	24	18	13
Patras	40	17	34
Syra	1	0	1
Triccala	38	24	34
Corfu	4	5	2
Volo	115	47	93
Larissa	41	29	44
Zante	7	4	19
Calamata	51	12	21
Pyrgos	22	19	21
Tripolitza	2	2	8

[1] P. E. Gittard, who in 1834 published *Considérations générales sur la Constitution physique du Péloponèse et son Influence sur le Caractère et les Maladies de ses Habitans*, noticed that malaria is not confined in Greece to the neighbourhood of large lakes. Of course in his day it was not possible for science to detect the true explanation of this fact, which is, that small ground-puddles are quite sufficient to breed the carriers of the disease.

[2] A Government measure, passed some months ago, secures this very necessary reform.

[3] Calculated from the mortality tables published by the Greek Government.

The average mortality in malarial sickness is, for Greece, 1 in 176.[1] Taking the census of 1896, we obtain the following percentage of sickness from malarial disease:—

	1905.		1906.		1907.		
	No. of cases.	Per cent.	No. of cases.	Per cent.	No. of cases.	Per cent.	Population.
Athens ...	10,032	8·2	8,976	7·3	12,496	10·2	122,053
Piraeus ...	4,224	8·2	3,168	6·2	2,288	4·4	51,020
Patras ...	7,040	18	2,992	7·8	5,984	15·7	37,985
Syra ...	176	·8	—	—	176	·8	22,032
Triccala...	6,688	31.6	4,224	19·9	5,984	28·2	21,149
Corfu ...	704	2·3	880	3	352	1·2	29,135
Volo ...	20,240	120·5	8,272	49·2	16,368	97·4	16,788
Larissa ...	7,216	46·9	5,104	33·2	7,744	50·3	15,373
Zante ...	1,232	8·2	704	4·7	3,344	22·4	14,906
Calamata	8,976	56·2	2,112	13·2	3,696	23·2	15,956
Pyrgos ...	3,872	30·4	3,344	26·3	3,696	29	12,708
Tripolitza	352[2]	3·3	352	3·3	1,408	13·4	10,465

It is obvious that these figures can be only approximately correct, especially as the census, from which the population is taken, is now more than eleven years old. Nevertheless, the evidence is enough to prove that in the Greek towns the number of malaria cases varies considerably from year to year, and that the percentage may be anything from zero to a very high figure, according to the healthiness or unhealthiness of the locality. Many other statistical estimates show how severe is the scourge under which Greece is suffering. As Ross[3] says, the Greek army is as badly infected as was our Indian army some time ago.[4]

[1] Η ἐλονοσία ἐν Ἑλλάδι, p. 13.

[2] The real figure is 795, see *ibid.*, p. 430.

[3] Jones, Ross, Ellett, *Malaria*, p. 11.

[4] Η ἐλονοσία ἐν Ἑλλάδι, p. 23.

Year.	Average strength of the army.	Cases of malarial sickness.	Percentage.
1896	21,000	7,791	37·1
1898	31,750	14,249	44·8
1899	21,519	6,929	32·1
1900	21,196	7,002	33·0
1901	18,141	7,228	39·8
1902	19,518	5,435	27·8
1903	19,800	6,745	34·0
1904	20,095	6,251	31·1
1905	19,036	6,766	35·5

Calculations made from the admissions to Athenian hospitals show that the various kinds of malaria occur at Athens in the following proportions [1]:—(1) Intermittent fevers (*διαλείποντες πυρετοί*), 91·52%; (2) remittent fevers (*ὑφέσιμοι πυρετοί*), 3·44%; (3) pernicious fevers (*κακοήθεις πυρετοί*), ·30%; (4) blackwater fever (*αἱμοσφαιρινουρικοὶ πυρετοί*), ·06%; (5) malarial cachexia (*καχεξίαι*), 4·66%. For Greece generally the proportions are [2]:—(1) 91·67%; (2) 6·00%; (3) ·27%; (4) ·09%; (5) 1·95%.

Out of 125 cases of pernicious malaria in the Greek army no less than 113 were of the comatose form, while of 2,610 cases of intermittent fever 2,020 were quotidian, 518 tertian and 72 quartan.[3] For Greece generally, out of 28,157 cases, 20,789 were quotidian, 6,840 tertian, and 528 quartan. This gives 73·83%, 24·30%, and 1·87% respectively.[4]

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 129.

[2] *Ibid.*, p. 130.

[3] *Ibid.*, p. 390.

[4] *Ibid.*, p. 131.

As to the ages of the patients, Dr. Cardamatis gives the following summary[1]:—

Between the ages	0—1	occur	1·27%	of the cases.
,, ,,	1—7	,,	15·87%	,,
,, ,,	7—15	,,	21·63%	,,
,, ,,	15—20	,,	13·09%	,,
,, ,,	20—30	,,	21·02%	,,
,, ,,	30—40	,,	10·71%	,,
,, ,,	40—50	,,	7·94%	,,
,, ,,	50—60	,,	4·58%	,,
,, ,,	60—70	,,	2·12%	,,
,, ,,	70—80	,,	·56%	,,
,, ,,	80—90	,,	·08%	,,
,, ,,	90—100	,,	·03%	,,

The periods of the year when malaria is most common may be seen from the army statistics for the years 1882—1886.[2] Out of 14,027 cases of malaria:—

662	occurred	in	January
442	,,	,,	February
440	,,	,,	March
269	,,	,,	April
327	,,	,,	May
945	,,	,,	June
1,991	,,	,,	July
2,322	,,	,,	August
2,329	,,	,,	September
1,866	,,	,,	October
1,451	,,	,,	November
983	,,	,,	December.

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 134. The percentages may vary in different parts of Greece, but the above are approximately correct.
[2] *Ibid.*, p. 385.

These figures may be compared with those from the Athenian hospitals,[1] which give :—

3·91%	of the cases	to	January
2·94%	,,	,,	February
3·92%	,,	,,	March
4·07%	,,	,,	April
5·21%	,,	,,	May
7·57%	,,	,,	June
12·19%	,,	,,	July
16·34%	,,	,,	August
16·28%	,,	,,	September
13·13%	,,	,,	October
8·83%	,,	,,	November
5·54%	,,	,,	December.

The cases that occur in winter are chiefly relapses; chill, fatigue or other strain brings out the malaria which has been latent since the warmer months.

Prof. Savvas [2] gives a very complete summary of the statistics sent to the League by doctors practising in the various districts of Greece :—

District.	Proportion of the Inhabitants suffering from Malaria.
Attica ...	... 10% in some places, 100% in others (Marathon).
Aegina ...	... The disease is rare.
Megaris...	... In Eleusis 5%; in Erythrae 60-72% of the school-children had enlarged spleens.
Thebes ...	... Little is yet known.
Levadia...	... There are great variations and fluctuations; e.g., in the δῆμος Levadia the proportion was 75% in 1905, and 20% in 1906; in Chaeronea 100% in 1905, and 10-15% in 1906.
Phthiotis	... 75% in 1905; 12% in 1906.
Parnassis	... In most places about 10%.
Locris ...	... In Atalanta 50%; elsewhere 10-30%.
Doris ...	... 15-50%.
Acarnania	... In Mesolongi 15-20%; Macrynia, 60-70%; Paracheloitis, 60%; Olenea, 70%.

[1] Ἡ ἐλονοσία ἐν Ἑλλάδι, p. 137.
[2] *Ibid.*, pp. 16—22.

District.	Proportion of the Inhabitants suffering from Malaria.
Trichonia	5-30%.
Eurytania	Very slight.
Naupactia	In Naupactis, 30-50%; elsewhere, 10-30%.
Vonitza and Xeromeros	In some places as high as 100%.
Nauplia	1-50%.
Argos	Few cases in the capital; elsewhere, 10-50%.
Corinthia	5-70%.
Spetzae and Hermionis	Little malaria, except in Hermione.
Hydra	3-4%.
Troezenia	2-35%.
Cythera	Little in Cythera itself; in one district, 40-60%.
Mantinea	From 4% to 80% (in Orchomenos and Mantinea).
Cynouria	10-50%.
Gortynia	25%.
Megalopolis	20-40%.
Patras	10-60%.
Aegialia	15-90%.
Calavryta	Average over 50%.
Elea	Little malaria in the hill-districts; in other places, 10-50%.
Lacedaemon	In the plain of Helos all are attacked. In the highlands, 3-5% only; elsewhere, about 20%.
Epidauros Limera	14-24%; in some parts nearly 100%.
Gythion	2-10%.
Oetylos	5-15%.
Messene	15-30%.
Pylia	40%.
Triphylia	3-40%.
Olympia	10-70%.
Chalcis	5-80%.
Xerochorion	20-25%.
Carystia	15-60%.
Scopelos	8-10%.
Syros	2-50%.
Zea (Kea)	1-3%. In 1905 40%.
Andros	1-3%.
Tenos	Little except in Panormos.
Naxos	10-45%.
Thera	There is little malaria.
Corfu	10-60%.

District.	Proportion of the Inhabitants suffering from Malaria.
Leucas	15-70%.
Cephallenia ...	But little malaria; likewise in Ithaca.
Zacynthos ...	1-10%.
Arta	Arta, 30%; Commeno and Bani, 80-100%.
Larissa	15-80%.
Tyrnavos ...	40-100%.
Agyia	20-50%.
Volo	The amount of malaria varies greatly: 2-3%, 10%, 20%, 25%, 30%, 80%, in different places.
Halmyros ...	8-25%.
Pharsala ...	10-40%.
Domocos ...	66% in Melitaea.
Triccala... ...	15-37%.
Calabaca ...	2-25%.
Carditza ...	5-75%.

The amount of malaria in modern Greece fluctuates considerably from year to year. Thus the proportion of malaria patients in the total number of sick people treated at the Ἀστυκλινικὴ Ἀθηνῶν was 56·36% in 1865, but only 19·93% in 1867. Since 1890 the proportion has varied from 25·49% to 8·88%, and there has been a considerable diminution during the last ten years, in spite of the epidemic of 1905.[1]

For the year 1905 the Anti-malaria League received from physicians throughout the country reports dealing with a population of 448,068. Of these 216,909 fell sick. In the islands of the Gulf of Aegina the proportion was 21%, in the Aegean Islands 41%, in Euboea 28%, in the Ionian Islands 26·59%, in Thessaly 74%, in the rest of Greece about 50%. It is calculated that, out of a total population of 2,433,806, no fewer than 960,048 were attacked by malaria and 5,916 died.[2]

The reports of the physicians contain, besides bare statistics, information which will be important when we come to consider the effects of malaria in ancient Greece.

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, pp. 126, 127.
[2] *Ibid.*, pp. 186—191.

(1) The writers are unanimous that, although no age is spared, children are the great sufferers from malarial disease.[1] There is therefore a tendency[2] for the infection to fall upon different persons in different years; in other words, a large proportion of the population becomes infected in time.[3]

(2) Nearly all the writers point out that the custom of sleeping in the open, either to avoid the stuffy heat of the house or because the necessities of agriculture demand it, is the cause of much illness.[4]

(3) Malaria has, in many places, become less common or less severe during recent years. This is due, partly to drainage, partly to improved treatment and the use of quinine.[5]

(4) Many sick never come under the physician's notice at all,[6] so that the amount of malaria in the country is probably much greater than the amount reported.

(5) The evil consequences are seen in the following ways:—

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, pp. 40, 220, 237, 240, 244, 247, 329, 334, 353, 366, 367, 418, 436. 461, 526, 613, 628.

[2] A *tendency* only, for, of course, other factors have to be considered, *e.g.*, the well-known truth that malaria is apt to recur, at least until comparative immunity is acquired.

[3] ἅπαντες σχεδὸν οἱ κάτοικοι τῶν πέριξ χωρίων . . . προσβάλλονται ἀλληλοδιαδόχως, Dr. Carnotis (speaking of Olympia). Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 223.

[4] Ἡ ἑλονοσία ἐν Ελλάδι, pp. 202, 204, 205, 206, 207, 208, 212, 213, 214, 216, 223, 226, 230, 234, 235, 236, 244, 245, 251, 253, 254, 352, 489, 521, 526, 577, 636.

[5] *Ibid.*, pp. 207, 254, 257, 267, 372.

[6] *Ibid.*, pp. 218, 441, 480, 510, 540, 587, 618 (ποιοῦντες χρῆσιν καθαρτικοῦ καὶ κινίνης).

(*a*) The most malarious districts are also the most fertile.[1]

(*b*) The loss of time and money is very great.[2]

(*c*) The effect upon the rising generation is most disastrous.[3]

(*d*) The victims of malarial cachexia are weakened in body and mind.[4]

(*e*) The inhabitants of malarious districts age and die prematurely.[5]

[1] Stéphanos, *La Grèce*, 442, 443, "dans les districts les plus fertiles de la Grèce, de grandes étendues du sol se trouvaient sous l'influence de la malaria, cause de misère physiologique, d'une natalité relativement faible et de mort prématurée pour une grande partie de leur population." Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 215, *τῆς μάστιγος, ἥτις κατατρύχει κυρίως τὰ εὐφορώτερα μέρη τῆς Ἑλλάδος*. See also the remarkable passage on p. 282, where the present and former conditions of the *τετράπολις τοῦ Μαραθῶνος* are compared.

[2] *Ibid.*, pp. 220, 469.

[3] *Ibid.*, p. 40, *τῶν παιδίων, ἅτινα, ἐκ τοιούτων νοσοπλήκτων καὶ προώρως γηρασκόντων προερχόμενα γονέων, εἶνε καὶ ταῦτα καχεκτικά, δυσκόλως ἀνδροῦνται καὶ προώρως θνήσκουσι, συγχρόνως δὲ δεικνύουσι μεγίστην προδιάθεσιν πρὸς τὸ ἕλειον μίασμα, ὅπερ, ὡς ἡ μικροβιολογικὴ ἔρευνα καὶ ἡ κλινικὴ παρατήρησις ἀπέδειξαν, προσβάλλει καὶ φονεύει ταῦτα συχνότερον ὑπὲρ πᾶσαν ἄλλην ἡλικίαν.*

[4] Stéphanos, *op. cit.*, p. 486, "Il ne faut pourtant chercher l'activité du Grec ni dans les contrées où la malaria, en infectant fortement l'organisme, en brise la vigueur, etc." Ἡ ἑλονοσία ἐν Ἑλλάδι, pp 234, 238, 247 (*Βαθέως ἐμπεποτισμένοι ἀπὸ γενεῶν ἤδη καὶ λόγῳ ῥώμης ἠθικῆς καὶ λόγῳ σφρίγους κ.τ.λ.*), 333, 420 (*τῆς σωματικῆς καὶ διανοητικῆς ἐξαντλήσεως*), 441 (*τὸ εἶδος τοῦτο τῶν πυρετῶν, ὅπερ ἐπιπολάζει ἁπανταχοῦ τῆς Ἑλλάδος καὶ καταστέλλει τὰς δυνάμεις τὰς σωματικὰς καὶ πνευματικὰς τῶν κατοίκων της*).

[5] Stéphanos, *op. cit.*, p. 443. Ἡ ἑλονοσία ἐν Ἑλλάδι, pp. 40, 363 (*ὀλιγόβιοι ὡς τὰ πολλά*), 364 (*οἱ δὲ κάτοικοι εἰσὶν ὡς τὰ πολλὰ ὀλιγόβιοι*). See also p. 248 (where it is said that the victims of malaria fall an easy prey to other diseases) and p. 441 (of Epidauros Limera) *Καχεξίαι ὅμως πολλαὶ (δι' οὓς λόγους ἀνεφέραμεν) καὶ συνεπῶς ἐλαφρὰ γριππώδης προσβολὴ ἢ ἄλλης φύσεως νόσημα ἀστραπιαίως διευθύνει τούτους εἰς τὰς αἰωνίους μονάς.*

The reader of these Reports is struck, not only by the number of districts where more than 75% of the population fall victims to malaria every year,[1] but also by the extent of the land capable of fostering the disease in years of epidemic paludism. Even in a dry region, such as Attica, the number of possible *foci* is very great,[2] and, when the whole of Greece has been surveyed for the purpose of estimating the amount of marsh-land, the "malaria map"[3] of the country will show a dangerous state of affairs. Apart from the permanent marshes, there are many other collections of water that afford good breeding-places to the mosquitoes. As is well known, the Anophelines prefer small puddles on the ground. The innumerable valleys of Greece are easily flooded; while the mountain-torrents, by overflowing their banks or by partially drying up, give rise to series of small

[1] As, for instance, in the district of Marathon, Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 281, where Dr. A. K. Anastasopoulos says: Σὺν τῇ παρόδῳ δὲ τοῦ χρόνου θὰ ἐπενέγκῃ δι' ἐκφυλίσεως ἀλλὰ καὶ ἀμέσως αὕτη τὴν ἐξαφάνισιν τῶν κατοίκων τοῦ δήμου καὶ δὴ τῶν πεδινῶν. Πάντα δύσπιστον θὰ πείσῃ περὶ τῆς ἀληθείας ταύτης μία καὶ μόνη εἰς Μαραθῶνα ἐπίσκεψις, διότι θὰ ἴδῃ οὗτος τὸ πένθος εἴς τε τὴν περιβολὴν καὶ εἰς τὴν μορφὴν τῶν Μαραθωνίων. Μορφαὶ μελανείμονες, γεωδῶς ὠχραί, στηριζόμεναι ἐπὶ κορμοῦ ἀσθενικοῦ μετὰ πελωρίας προεχούσης κοιλίας καὶ μελῶν κατεσκληκότων συμβολίζουσι τὸν σημερινὸν Μαραθῶνα ἐν τῇ πραγματικότητι. It is suggested that the construction of the railway from this district to Boeotia is responsible for the frightful prevalence of malaria; certain forms of the disease (συνεχεῖς, κακοήθεις, παγετώδεις καὶ αἱμορραγικαὶ μορφαί) being unknown at other times. How the Anophelines escaped infection previously does not appear. The question deserves fuller inquiry. In highly malarious regions such as this the harm is much increased by empiric treatment. See *ibid.*, p. 441.

[2] See Cardamatis in Ἡ ἑλονοσία ἐν Ἑλλάδι, pp. 264-267. Salamis is a good example of a district which, though not very malarious in ordinary years, may sometimes be visited by fearful epidemics. In 1886, out of a population of 5,000, 4,500 fell ill. *Ibid*, p. 274.

[3] Stéphanos, *op. cit.*, pp. 493, 494, gives a good estimate of the amount of marsh in the country, but more detail is wanted.

pools. Accordingly a wet winter, followed by a dry summer, is most apt to cause an epidemic.

The present malarious state of Greece must be a matter of surprise to many. In England at least, although it was recognised that Greece suffered some loss from malaria,[1] few readers of the articles written by Major Ross failed to be struck by the obscurity in which the condition of the country has been kept hitherto. The inhabitants, accustomed to the disease, and perhaps influenced by the fatalism which so often accompanies it, have not proclaimed from the house-tops their unhappy condition. If therefore the old Greek literature does not insist much upon the prevalence of malaria, it must not be inferred that the country was healthy. Owing to the absence of statistics it is not possible accurately to measure the extent to which ancient Greece was infected; but, although changes favouring the disease have occurred since the classical period,[2] these are counterbalanced by the improved treatment of modern times, and especially by the use of quinine. The ordinary literature may not contain as much evidence as might have been expected; yet the great attention paid to malaria by the medical writers shows how large a part it played in the lives of the inhabitants.

[1] Mahaffy, *Rambles and Studies in Greece* (fifth ed.), p. 319, note 2: "On the foundation of the new Greek kingdom, it was seriously debated whether Corinth should not be the capital; but the constant prevalence of fever in the district, together with sentimental reasons, determined the selection of Athens." It was the loss that malaria was causing to the Copaic Company that led to the investigations of Major Ross.

[2] E.g., the deforestation of the mountains. See Stéphanos, *op. cit.*, 493, and Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 9. I think there is a tendency to exaggerate the importance of forests on the hills. At any rate, mountain-torrents (χειμάρροι, χαράδραι) were common enough in ancient times, so that the woods were not sufficient to prevent them.

CHAPTER II.

Malaria in the Non-Medical Greek Writers.

"In fact," says Daremberg,[1] "the great disease of Greece (islands and mainland), that which puts its impress on almost all the other affections of the country, is this remittent or pseudo-continuous fever." If to remittent malaria be added the intermittent forms of the disease, the statement is perfectly correct, and represents a truth of great importance for the student of Greek life and Greek history. In considering the question it will be convenient to divide the enquiry into two parts, and to examine separately the non-medical and the medical evidence.

The first mention of πυρετός, the most general term for "fever," is in Homer,[2] who states that the dog-star brings much πυρετός upon miserable mortals. As summer and autumn are the times when malaria is most prevalent in modern Greece, it has been supposed that here there is conclusive evidence that malaria was well known in the prehistoric period. If this view be correct, it should be remembered that the words of the poet must not be taken to include the whole of Greece, but only that part of it (probably the west coast of Asia Minor) with which he was best acquainted. The term πυρετός might be employed to designate typhoid, which also is an autumnal disease, but I should certainly be inclined to identify it with malaria were it not for the comment of the scholiast upon this passage. It is as follows:— "Notice that the word πυρετός is to be found only here, and that it is used in the ordinary sense of the word,

[1] *Histoire des Sciences médicales,* vol. i., p. 109.
[2] *Iliad.*, xxii. 31.

and not, as some take it, to signify the heat of the atmosphere." [1] The commentator notices, in fact, that *πυρετός* occurs but once in Homer, and that there was some authority for the interpretation "heat." Now "fever" is certainly the more natural meaning, and I can only account for the fact that the other view was not uncommon by supposing a tradition existed that fever was unknown in Homer's day. Otherwise it is hard to see why any doubt was entertained at all. Too much stress must not be laid upon this comment, but at least it leaves the mind in an uncertainty which otherwise, perhaps, would never have arisen.

The word *πυρετός* does not occur again before the fifth century, and during this long interval the enquirer has to make what use he can of vague and general references. Indeed, throughout the whole of the non-medical literature, the sure tests of malaria, periodicity and enlarged spleen, are rarely mentioned; the conjunction of disease and marshy land [2] is, as a rule, the most trustworthy sign to be obtained.

Cardamatis [3] holds that the plague which infected the Greek army before Troy [4] may have been malaria, caused by the marshy nature of the district in which the camp was pitched. It does not seem wise to press too far the words of a poet, who must always be vague in referring

[1] *ἡ διπλῆ, ὅτι ἅπαξ ἐνταῦθα ὁ πυρετός, καὶ ὅτι πυρετὸν κυρίως λέγει, οὐχ ὥς τινες δέχονται τὴν διάκαυσιν τοῦ ἀέρος.* Is it possible that the fragment of Dicaearchus, in which the golden age is described, has any relation to the tradition that once fever did not exist? *τὸ δ' αὐτὸ καὶ τοῦ σχολὴν ἄγειν αἴτιον ἐγίγνετο αὐτοῖς καὶ τοῦ διάγειν ἄνευ πόνων καὶ μερίμνης, εἰ ὁέ τι τῶν γλαφυρωτάτων ἰατρῶν ἐπακολουθῆναι δεῖ διανοίᾳ, καὶ τοῦ μὴ νοσεῖν.* Müller, *F.H.G.*, ii. 233. The Homeric line was famous in antiquity. The Latin poets imitated it, and it is quoted by the scholiast on Aratus *Phaenom.*, 332.

North warns us that diseases due to the influence of marshes include rheumatic and pulmonary disorders. *Roman Fever*, p. 89.

[3] In 'Η ἑλονοσία ἐν 'Ελλάδι, pp. 111, 112.

[4] *Iliad*, i., 10, *νοῦσον ἀνὰ στρατὸν ὦρσε κακήν.*

to disease, but if he had any particular sickness in mind, it may well have been typhus or typhoid, disorders which have often proved disastrous in war time. The other references to disease in the Homeric poems are vaguer still. "In the island of Syria there is no dearth, and no hateful sickness falls on wretched mortals." [1] In this passage the poet appears to be thinking of disease in general, but more in particular of the famine-plagues, usually of the nature of typhus, which occur so frequently in early civilisation before the importation of corn makes the inhabitants independent of the local harvests. There appear to be no other places in Homer [2] where even a likely guess can be made as to the nature of the diseases prevalent in his day.

In Hesiod diseases are mentioned two or three times, [3] but here again it is impossible to determine their character, except in the famous line where famine and plague are coupled together. [4] It is certainly most noteworthy that no clear reference is made to malaria, for Boeotia, the country in which Hesiod lived, is very marshy, and particularly favourable to the growth of the mosquito. [5] The nearest approach to a reference (but it surely cannot be regarded as such) is to be found in *Works* 416—418. [6] Suidas [7] says that the name

[1] *Odyssey*, xv., 407, 408.

[2] *Iliad*, xiii., 667, and *Odyssey*, xi., 201, may refer to consumption, as "wasting away" is mentioned, but of course it is impossible to speak with any confidence.

[3] *Works*, 92, 102, 242-244.

[4] λιμὸν ὁμοῦ καὶ λοιμόν, *Works*, 243.

[5] Ross, in *Journal of Tropical Medicine*, Nov. 15, 1906. Cf., Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 17, where it is stated that a great part of the population is attacked by malaria.

[6] μετὰ δὲ τρέπεται βρότεος χρὼς
πολλὸν ἐλαφρότερος· δὴ γὰρ τότε Σείριος ἀστὴρ
βαιὸν ὑπὲρ κεφαλῆς κηριτρεφέων ἀνθρώπων
ἔρχεται ἡμάτιος.

[7] Hesiod, fr. 10 (Rzach), Ἐπιάλτην· Ὅμηρος καὶ Ἡσίοδος· καὶ οἱ Ἀττικοὶ τὸν δαίμονα· διὰ δὲ τοῦ φ τὸν ἄνδρα Ἐφιάλτην. καὶ τὸν ῥιγοπύρετον λεγόμενον.

Epialtes, used by Homer and Hesiod, was sometimes applied to ague, but the context makes it clear that this meaning of the word is not necessarily that in which it was used by the early poets. In fact Suidas appears to have confused Epialtes with ἠπίαλος, a word which must receive full treatment later. On the whole, the evidence is in favour of the view that malaria was unknown to Hesiod, for it is scarcely conceivable that, had it existed in his day where he lived, he would have omitted to mention it as one of the plagues of the farmer during the hot months. It is also most unlikely that malaria was a Boeotian disease in prehistoric times, for on the western shores of lake Copais, now one of the most unhealthy districts of Greece and scarcely habitable, there dwelt a proverbially rich people whose city was the famous Orchomenus.[1] This flourishing state of the country is quite incompatible with the presence in it of such a deadly enemy as endemic malaria, and, had malaria existed at all, it must have become endemic at once owing to the neighbourhood of mosquito-breeding marshes. The early inhabitants of Greece seem to have chosen deliberately sites which in later times were among the most malarious in the country; this is surely strong evidence that at first they were healthy.

There is nothing of importance to chronicle in the literature of the period between Hesiod and Theognis,[2] that is, from 700 B.C. to nearly 550 B.C. But in the latter poet there is a passage that requires the most careful

[1] Bury, *History of Greece*, p. 25. See also *Iliad.* v., 708:

ὅς ῥ' ἐν Ὑλῃ ναίεσκε μέγα πλούτοιο μεμηλώς,
λίμνῃ κεκλιμένος Κηφισίδι· πὰρ δέ οἱ ἄλλοι
ναῖον Βοιωτοὶ μάλα πίονα δῆμον ἔχοντες.

This could not possibly be a description of a malarious country. On the other hand, the geographical condition of Boeotia may have changed. See *Strabo*, ix., p. 406.

[2] I do not think that the words of Archilochus, *fr.* 58 (43) (Hiller) can refer to malaria. The passage is: ἔλπομαι, πολλοὺς μὲν αὐτῶν Σείριος κατανεῖ ὀξὺς ἐλλάμπων.

consideration. Theognis, a supporter of the oligarchical party in Megara, is enlarging upon the miseries awaiting the citizen who is not wealthy, and he asserts that nothing crushes the good man so much as poverty, neither old age nor yet *ἠπίαλος*.[1] The word *ἠπίαλος* has a most uncertain history, and whatever be the etymological connexion, if any, between the words, it was early confused with Ephialtes and Epiales. But it is clear that there was (1) a giant Ephialtes, son of Aloeus, [2] and (2) a demon Epiales.[3] This demon was supposed to cause nightmare,[4] the cold shiver of which was sometimes called *epiales*. In all probability *ἠπίαλος* also at one time meant nightmare; indeed a German commentator [5] on Theognis, 174, calls poverty "a nightmare or ghost that binds and harasses a man" (*πενία* quasi incubo vel larva quaedam est hominem vinciens et vexans). But *ἠπίαλος* certainly meant in later times ague, or the shivers that precede it, although the scholiast on Aristophanes *Wasps*, 1038, mentions an interpretation which identified the word with Epiales, Tiphys, Euopas. The confusion between the two meanings (nightmare, ague) is well illustrated by the passage in the *Wasps*, 1037—1041 : [6] "And the poet says

[1] Ll. 173, 174, *ἄνδρ' ἀγαθὸν πενίη πάντων δάμνησι μάλιστα καὶ γήρως πολιοῦ, Κύρνε, καὶ ἠπιάλου.*

[2] *Iliad*, v., 385.

[3] Sophron, *fr.*, 99b (Ahrens), *Ἡρακλῆς Ἠπιάληται πνίγων.*

[4] See Eustathius on *Od.* xi., 315, who mentions several forms of these words, each meaning *δαίμων τοῖς κοιμωμένοις ἐπερχόμενος.*

[5] *Anthologia Lyrica* (Hiller), p. xxvii. Cf. also *Etymol. Mag.*, *ἠπίαλος καὶ ἠπιάλης καὶ ἠπιόλης σημαίνει τὸν ῥιγοπύρετον, καὶ δαίμονα τοῖς κοιμωμένοις ἐπερχόμενον.*

[6] *φησίν τε μετ' αὐτοῦ*
τοῖς ἠπιάλοις ἐπιχειρῆσαι πέρυσιν καὶ τοῖς πυρετοῖσιν,
οἳ τοὺς πατέρας τ' ἤγχον νύκτωρ καὶ τοὺς πάππους ἀπέπνιγον,
κατακλινόμενοί τ' ἐπὶ ταῖς κοίταις ἐπὶ τοῖσιν ἀπράγμοσιν ὑμῶν
ἀντωμοσίας καὶ προσκλήσεις καὶ μαρτυρίας συνεκόλλων.
Scholiast : *ἠπίαλος τὸ πρὸ τοῦ πυρετοῦ κρύος. Δίδυμος δέ φησι, δαίμων ὃν Ἠπιάλην καὶ Τίφυν καὶ Εὐόπαν καλοῦσι.* I construe *ἐπὶ τοῖσιν . . . . ὑμῶν* with *συνεκόλλων*. Dr. Rouse suggests "on the beds, smothering your easy-going folk."

that he attacked last year the ἠπίαλοι and the fevers that were strangling your sires by night and throttling your grandsires; lying down upon the beds of your easy-going folk they were concocting against them affidavits, summonses and testimonies." The sense of "nightmare" suits this passage admirably, and yet with ἠπίαλοι are connected fevers. Hesychius calls ἠπίαλος "the shivers preceding fever;"[1] Galen[2] defines it as a protracted quotidian, of such a kind that the patient felt fever and shivering at one and the same time and in every part of the body, adding that some Attic writers so name the "shivers that precede fever." Even in Aristophanes the word distinctly has this meaning. Besides a fragment[3] of the poet which clearly states this, there is a reference in the *Acharnians*[4] (date 425 B.C.—three years before the *Wasps*) to a man returning home, after riding on horseback, with an attack of ἠπίαλος upon him. This is a certain example of the truth that an attack of malaria may, in a malarious country, originate in any violent bodily exertion.

It seems likely that the shivers which are so symptomatic of a malarial attack caused the disease to be called, by the Athenians at least, perhaps on its first

[1] ῥῖγος πρὸ πυρετοῦ.

[2] περὶ διαφορῶν πυρετῶν Kühn, vii., p. 347, τούτου τοῦ γένους (sc. χρόνιος, ἀμφημερινός) ἐστὶ καὶ ἠπίαλος πυρετὸς ἰδίως ὀνομαζόμενος, ὅταν ἅμα πυρέττουσί τε καὶ ῥιγοῦσι, καὶ ἀμφοτέρων αἰσθάνονται κατὰ τὸν αὐτὸν χρόνον, ἐν ἅπαντι μορίῳ τοῦ σώματος . . . φαίνονται δὲ τῶν Ἀττικῶν ἀνδρῶν ἔνιοι καὶ τὸ πρὸ τοῦ πυρετοῦ ῥῖγος οὕτως ὀνομάζοντες. Cf. [Aristotle], *Prob.* xxvii. 2, τοῖς ἠπιαλοῦσιν, οἳ ἅμα τῷ ῥιγοῦν διψῶσιν, and Pollux, *Onom.* iv. 186.

[3] *Fr.* 315 (Dindorf) ἅμα δ' ἠπίαλος πυρετοῦ πρόδρομος.

[4] L. 1165, ἠπιαλῶν γὰρ οἰκάδ' ἐξ ἱππασίας βαδίζων κ.τ.λ. The only other early reference to ἠπίαλος that I can find outside the medical writers is Phrynicus (*comicus*) in Athenaeus, ii. 44 (μουσικὸς) ἀηδόνων ἠπίαλος—he was a nightmare to the nightingales, or gave them an ague. Throughout the above discussion I am much indebted to Harrison, *Prolegomena*, p. 167, "The Ker as Bacillus," and Pauly-Wissowa, *s. vv.* Ἐπιάλης, Ἡπιάλης, and Ephialtes (2).

introduction, "nightmare-sickness;" and that afterwards, when the various types became more familiar through long experience, the name ἠπίαλος was used more particularly of malaria characterized by pronounced shivering,[1] while it was often applied to the shivering itself.

It is therefore quite possible that the passage in Theognis does refer to malaria, in which case the disease was well known on the mainland of Greece as early as the second half of the sixth century B.C., although the evidence cannot be regarded as conclusive. The account of the Ionian Greeks of Asia Minor given by Herodotus would lead one to suppose that they also had become infected by this date, but here again no certain inference is possible. It is related that Dionysius, the energetic leader of the Phocaeans, offered to train the badly disciplined Greek crews of the fleet which had been collected to resist the Persians. For a week the Greeks persevered, when, worn out by unaccustomed exertions and the heat, they refused to practise their drill any longer. Many of them had fallen ill, and many more were expecting the same fate.[2] It is indeed hard to believe that any other disease except malaria could produce so much sickness in so short a time; while if the Greeks were already infected, unusual exertion would certainly have precipitated attacks of fever.[3]

[1] Hence the term ῥιγοπύρετος. See Moeris, ἠπίαλον τὸ πρὸ τοῦ πυρετοῦ ψῦχος. Professor Edson, of Denver, tells me that a common name in New England for malaria is "chills and fever." The expression is used, not for two symptoms, but almost as a single word. "Been sick?" "Yes." "What with?" "Oh! chills and fever." The frequent association of ἠπίαλοι and πυρετοί (*Wasps*, 1038) must have a like origin.

[2] Herodotus, vi., 12, καὶ δὴ πολλοὶ μὲν ἡμέων ἐς νούσους πεπτώκασι, πολλοὶ δὲ ἐπίδοξοι τώυτὸ τοῦτο πείσεσθαί εἰσι. The date of this incident is 494, B.C.

[3] It may be a pure guess, but the malarious low-lying districts of Western Asia possibly contributed to the degeneration of the Persians themselves.

There can be little doubt that Magna Graecia was malarious. Strabo says that Posidonia was made unhealthy by the marshes near it,[1] although, of course, he is no authority for early times. Croton, on the other hand, as though in marked contrast to the rest of the neighbourhood, was proverbial for the good health of its inhabitants,[2] and since Archilochus speaks of the "lovely land" of Siris,[3] it may be that this district also, at least in early times, did not suffer much from malarial disease. Both Diodorus[4] and Strabo[5] mention the fortunate position of Sybaris, but in all probability they are referring to the extraordinary fertility of the soil. But Athenaeus,[6] on the authority of Timaeus, gives us information which leaves little doubt that Sybaris was malarious. Among the causes that provoked the Sybarites to luxurious habits he mentions the position of the town, which, being in a hollow, was in summer excessively hot at mid-day, and very cold in the morning and evening. Hence arose the saying that he who did not wish to die young ought to avoid, in Sybaris, seeing the sun, either when it rose or when it set.[7]

[1] Strabo, v., p. 251, *ποιεῖ δὲ αὐτὴν ἐπίνοσον ποταμὸς πλησίον εἰς ἕλη ἀναχεόμενος.*

[2] Strabo, vi., pp. 262, 269.

[3] Archilochus, *fr.* 17, 18 (9, 3). [4] xii., 9. [5] vi., p. 263.

[6] xii. 519, 520, *δοκεῖ δὲ . . . . . ὅ τε τῆς πόλεως τόπος . . . . . συμπαροξῦναι πάντας ἐκτρυφῆσαι, καὶ ποιῆσαι ζῆσαι ὑπὲρ τὸ μέτρον ἐκλελυμένως. ἡ δὲ πόλις αὐτῶν, ἐν κοίλῳ κειμένη, τοῦ μὲν θέρους ἕωθέν τε καὶ πρὸς ἑσπέραν ψῦχος ὑπερβάλλον ἔχει, τὸ δὲ μέσον τῆς ἡμέρας καῦμα ἀνύποιστον· ὥστε τοὺς πλείστους αὐτῶν ὑπειληφέναι πρὸς ὑγίειαν διαφέρειν τοὺς ποταμούς· ὅθεν καὶ ῥηθῆναι, ὅτι τὸν βουλόμενον ἐν Συβάρει μὴ πρὸ μοίρας ἀποθανεῖν, οὔτε δυόμενον οὔτε ἀνίσχοντα τὸν ἥλιον ὁρᾶν δεῖ.*

[7] See Lenormant, *La Grande-Grèce*, vol. i., p. 287. All observers have noticed that the inhabitants of malarious districts soon grow old and die. What is true of the individual is also true of the race. A people confined to a malarious country, even if they have the energy partially to control the disease, quickly decline. It is not necessary for the infection to be introduced when the state has grown to prosperity in a healthy condition, although in this case the disastrous influence of malaria is more marked.

This advice is often given to dwellers in malarious regions, as chill is almost certain to precipitate an attack of fever, and further, mosquitoes bite most at night. It should be remembered that the descriptions of life in Sybaris are all much later than the destruction of the city. Later writers were wont to dwell upon the laziness and effeminacy of its inhabitants, but these faults have been much exaggerated. The prosperity of Sybaris necessarily implies energy and determination. The evil reputation of the Sybarites is due to distorted versions of their attempts to counteract the unhealthiness of their environment. But after making all necessary deductions for the bias of late historians, enough remains to show that the malarious nature of the district and the dread of fever exercised a most pernicious influence, and undoubtedly contributed to the ruin of the country.

It has been suggested[1] that there were drainage works which diminished the amount of the disease. The recent excavations in Crete have shown that the ancients had quite advanced ideas on sanitary science, while it is clear that Ephesus[2] had a system of sewers. Nevertheless it seems unlikely that malaria was prevalent in Sybaris when the city was founded. Not only would colonists avoid, if possible, an unhealthy site,[3] but the rapid rise of the city to a prosperity that was proverbial forbids us to suppose that the inhabitants were much hindered by malarial disease. Pioneers always suffer most, as the story of the Panama Canal plainly shows.

When the district became malarious cannot be known, but it is certain that the disease increased,[4] until the dreadful condition resulted which is to be seen at the present day. This increase is probably due to changes

[1] See Lenormant, *op. cit.*, p. 225, and Garofalo, *Intorno Sibari e Turio*, p. 26. Garofalo refers also to Cannonero, *Dell' antica Città di Sibari*, pp. 8, 86, 87.

[2] Strabo, xiv., p. 640 (τοὺς ῥινούχους).

[3] See Garofalo, *op. cit.*, p. 143.

[4] Thucydides speaks of the coast-line as desolate (vi. 34).

in the course of the rivers,[1] which have considerably extended the surface of marsh and swamp.

Geographical changes have likewise been the ruin of certain sites in Asia Minor. The silting up of the rivers[2] has turned the whole territory of Miletus into a pestilential swamp, and the same agency has been at work at Ephesus.[3] At Miletus, Apollo and Artemis were identified with the sun and moon, and worshipped as the sources of healthy climate as well as of pestilence.[4] The city, therefore, was probably malarious, but not to such a degree as to make it uninhabitable.

The third Pythian ode, written by Pindar about 470 B.C., refers to the "hot plagues" [5] from which Hiero of Syracuse was suffering, and to the medical education of Asclepius, who was taught by Chiron to cure men "wasted with summer heat or the chill of winter." [6] Pindar, then, must have been familiar with fevers, and also with diseases particularly prevalent in summer. Of such malaria is a striking example.

Writing about the middle of the fifth century Empedocles (?) speaks of "chill diseases," [7] and we are reminded of the story that this physician and philosopher delivered Selinus from a plague by draining its marshes, or by turning two rivers into them.[8] Herodotus,

[1] It is certain that the two rivers, Crathis and Sybaris, between which the city was built, once had separate mouths. They now meet about 3 miles from the coast.

[2] Noticed by Herodotus (ii., 10).

[3] Strabo (xiv., p. 641) tells us that Attalus Philadelphus made the harbour more shallow in an attempt to render it less so.

[4] Strabo xiv., p. 635.

[5] *Pyth.* iii., 66 (Christ), *θερμᾶν νόσων.* Hiero, however, was suffering from stone.

[6] L. 50 (Christ), *ἢ θερινῷ πυρὶ περθόμενοι δέμας ἢ χειμῶνι.*

[7] *Anthologia Lyrica* (Hiller), p. 128; but the passage is of very doubtful authenticity. Democritus also is said to have written *περὶ πυρετῶν*, Müller, *F. H. G.*, ii., 25, 26.

[8] Diogenes Laertius, viii., 70; but Zeller, *Pre-Socr.*, ii., 120, throws doubt upon the story.

although he does not use the word πυρετός to denote any disease, informs us that the Greeks transformed into Pyretos the name Porata, which belonged to a tributary of the Ister.[1] This surely seems to show that in his day the Greeks were wont to associate "fever" with rivers and streams. The verb πυρέσσω occurs for the first time about the same period, being used by Euripides[2] and Pherecrates,[3] although in neither case does it necessarily refer to malaria.

It is in the *Oedipus Tyrannus* of Sophocles that a fairly complete description of a pestilence first occurs in non-medical literature. The date of the play is uncertain, but is put by Jebb between 429 and 420. Upon the city of Thebes has fallen a great disaster; "blighted are the fruits of the earth; blighted the herds of cattle and the barren pangs of women. Withal the Fever-god swooping down, a dreadful plague, is ravaging the city."[4] The passage would certainly recall to the minds of an Athenian audience the fearful ravages caused by the great Plague of 430, from which perhaps they were still suffering. But the details, the disease among men, murrain among the cattle and blight on the crops, certainly suggest one of those great "famine-plagues," so common in the early history of every nation,[5] which would most certainly remain as a vivid tradition even when with the advance of trade and civili-

[1] Herodotus, iv., 48.

[2] Euripides, *Cyclops*, 228, ὤμοι, πυρέσσω συγκεκομμένος τάλας.

[3] In Athenaeus, iii., 75, ὦ δαιμόνιε, πύρεττε μηδὲν φροντίσας κ.τ.λ. This passage may possibly refer to malaria precipitated by over-indulgence and carelessness.

[4] *Oed. Tyr.* 25,—

φθίνουσα μὲν κάλυξιν ἐγκάρποις χθονός,
φθίνουσα δ' ἀγέλαις βουνόμοις τόκοισί τε
ἀγόνοις γυναικῶν· ἐν δ' ὁ πυρφόρος θεὸς
σκήψας ἐλαύνει, λοιμὸς ἔχθιστος, πόλιν.

[5] For such plagues in England, see Creighton, vol. i., pp. 15-24. On p. 24 Creighton sums up as follows: "A bad season brought scarcity and murrain, and two bad seasons in succession brought famine and pestilence."

sation they had become rare, if not altogether things of the past. But again the effect upon child-birth is strongly suggestive of malaria.[1] There is other evidence for the view that malaria became common in Attica between 429 and 422, and the truth seems to be that Sophocles has united in one picture the symptoms of three different diseases, one of which was remembered as a tradition, while the other two formed part of the personal experience of his audience.

The *Wasps* of Aristophanes, brought out in the year 422, contains three references to "fever," and these, with the quotation from the *Acharnians* (date 425) and that from the fragments, which have already been given, are the only occasions when malaria is mentioned in the plays of the poet still extant. It is surely hard not to suppose that in the year 422 malaria was, for some reason or other, a disease very much talked about among the Athenians, especially when, in the parabasis of the *Wasps*, Aristophanes claims credit for attacking the "agues and fevers last year." The language is certainly figurative, referring to people who were regarded as objectionable, but it becomes most full of meaning if the Athenians had recently suffered from an epidemic of fevers attended by shivering. In an earlier part of the play the chorus express surprise that the keen old juryman Philocleon is so long in joining his companions. "But perhaps," say they, "he has a swelling in the groin;[2] or may be the escape of that rascal yesterday has vexed him so that now he lies sick of a fever."[3]

[1] See *Journal of Tropical Medicine*, May 1900, for the effects of malaria upon pregnancy. Malaria sometimes attacks animals, but the disease among them is not to be associated with human malaria. See the same journal for Jan. 1, 1903. Porphyry says that horses and cattle have fever (*De abs.* iii., 7).

[2] *Wasps*, 277, τάχ' ἂν βουβωνιῴη.

[3] *Ibid.*, 281, διὰ τὸν χθιζινὸν ἄνθρωπον . . .

. . . . . .

διὰ τοῦτ' ὀδυνηθεὶς
εἶτ' ἴσως κεῖται πυρέττων.

A swollen spleen is typical of malaria, and this complaint may be alluded to in the first part of my quotation; with the second should be compared the words of Sir Samuel Baker: "In this country any grief of mind will insure an attack of fever, when all are more or less predisposed during the unhealthy season, from the commencement of July to the end of October."[1] The last allusion to fever in Aristophanes occurs towards the middle of the play, where Philocleon congratulates himself on the new arrangement, whereby he can play the juryman in his own house, because even if he have a fever he will nevertheless continue to draw his pay.[2]

I conclude from the *Wasps* that malaria was attracting particular attention at Athens during the last quarter of the fifth century. It was called the "nightmare-disease," although the simple term "fever" (*πυρετός*)[3] was also used to denote it. When the disease is first introduced into a country it attacks anybody, old or young, although it is most conspicuous among adults; after a time, when the disease has passed from the epidemic to the endemic stage, the old are partially immune, because they have probably had several attacks during their childhood.[4] Surely it is not a mere coincidence that Philocleon, who is twice mentioned as subject to "fever," is an old man, while the "fevers and agues" throttled the "sires and the grandsires" of the Athenian people. Malaria, then, was a comparatively new disease in Attica when Aristophanes wrote the *Wasps*, although

[1] *The Nile Tributaries of Abyssinia*, ch. ix.

[2] *Wasps*, 812,—

τοῦτ' αὖ δεξιόν·
κἂν γὰρ πυρέττω, τόν γε μισθὸν λήψομαι.

[3] After Aristophanes *πυρετός* nearly always means malaria, except in the medical writings.

[4] Sir Patrick Manson, *Lectures on Tropical Diseases*, p. 102: "This is the condition of every village in every highly malarious district; the adults are immune, the children are nearly all of them full of malaria parasites."

it certainly existed in other parts of Greece long before. This conclusion is quite in harmony with the *a priori* inference that could be drawn from the geographical condition of the district. Attica is a dry country,[1] and not so well adapted as other parts of Greece to the growth of the mosquitoes which carry malaria from man to man.

Plutarch[2] says that Pericles "seems" to have died of a mild attack of the Plague, but he does not vouch for the truth of the statement. It may well be that the recrudescences of this mysterious malady were different in type from the early cases,[3] but the symptoms, as given by Plutarch, are strongly suggestive of malaria. The disease of Pericles was not acute or intense (*σύντονον*) but long and of a sluggish (*βληχρᾷ*) nature: it was characterized by the variety of its phases, and it slowly wore away the strength and mental powers of the patient. If Pericles died of malaria, and the evidence is by no means conclusive, the passage from Plutarch has a special interest; for Theophrastus, from whom the story appears to be derived, quoted it as showing that moral states correspond to physical changes.

Diodorus Siculus refers to the recrudescences of the Athenian Plague. The same writer also mentions two epidemics that are said to have occurred in quite

[1] It was probably more marshy in ancient times. There have certainly been changes in the sub-soil water. See especially Cardamatis in Ἡ ἑλονοσία ἐν Ἑλλάδι, pp., 113-116, and 162-168.

[2] Plutarch, *Pericles*, 38, *τότε δὲ τοῦ* Περικλέους *ἔοικεν ὁ λοιμὸς λαβέσθαι λαβὴν οὐκ ὀξεῖαν, ὥσπερ ἄλλων, οὐδὲ σύντονον, ἀλλὰ βληχρᾷ τινι νόσῳ καὶ μῆκος ἐν ποικίλαις ἐχούσῃ μεταβολαῖς διαχρωμένην τὸ σῶμα σχολαίως καὶ ὑπερείπουσαν τὸ φρόνημα τῆς ψυχῆς. ὁ γοῦν Θεόφραστος ἐν τοῖς* Ἠθικοῖς *διαπορήσας εἰ πρὸς τὰς τύχας τρέπεται τὰ ἤθη καὶ κινούμενα τοῖς τῶν σωμάτων πάθεσιν ἐξίσταται τῆς ἀρετῆς, ἱστόρηκεν, ὅτι νοσῶν ὁ* Περικλῆς *ἐπισκοπουμένῳ τινὶ τῶν φίλων δείξειε περίαπτον ὑπὸ τῶν γυναικῶν τῷ τραχήλῳ περιηρτημένον, ὡς σφόδρα κακῶς ἔχων, ὁπότε καὶ ταύτην ὑπομένοι τὴν ἀβελτερίαν.*

[3] For the Athenian plague see Anglada *Etudes sur les Maladies éteintes et les Maladies nouvelles.*

early times.[1] The details given point clearly to malaria. If Diodorus is recording a true tradition, it must be inferred that epidemics of malaria were not uncommon in prehistoric Greece. But how little trust can be put in a late author who attempts to record early pestilences is obvious when we turn to his account of the Plague of 426 B.C. The Athenians, he says, suffered severe losses from the pestilence; then, in setting forth the causes of the disease, he gives what is undoubtedly a "malarial constitution."[2] He relates that during the winter there had been heavy rains, which had covered the country with swamps. The heat of the following summer drew up poisonous exhalations from the damp ground, and so the atmosphere was corrupted, "a thing which is seen to happen on unhealthy marshes." Obviously Diodorus has confused the Plague and malaria in this case, and therefore no weight can be attached to his account of prehistoric epidemics. It is, however, very remarkable that, in describing recrudescences of the same pestilence, Diodorus mentions the atmospheric conditions that cause malaria, and Plutarch gives malarial symptoms. The conclusion to be drawn is that either malaria was the most common type of pestilence in later times, so that writers were tempted to confuse it with other diseases, or else there was in Attica during the early years of the Peloponnesian War a serious epidemic of malaria, which was afterwards identified with the Plague.

If malaria became endemic in Attica soon after the Plague of 430 B.C., it would be natural to find that sick-

[1] Diodorus Siculus, iv., 82, and v., 82.

[2] xii., 58, *προγεγενημένων ἐν τῷ χειμῶνι μεγάλων ὄμβρων συνέβη τὴν γὴν ἔνυδρον γενέσθαι, πολλοὺς δὲ καὶ τῶν κοίλων τόπων δεξαμένους πλῆθος ὕδατος λιμνάσαι καὶ σχεῖν στατὸν ὕδωρ παραπλησίως τοῖς ἑλώδεσι τῶν τόπων, θερμαινομένων δ' ἐν τῷ θέρει τούτων καὶ σηπομένων συνίστασθαι παχείας καὶ δυσώδεις ἀτμίδας, ταύτας δ' ἀναθυμιωμένας διαφθείρειν τὸν πλησίον ἀέρα· ὅπερ δὴ καὶ ἐπὶ τῶν ἑλῶν τῶν νοσώδη διάθεσιν ἐχόντων ὁρᾶται γινόμενον.*

ness increased after that date. As a matter of fact disease did become more common, as will be shown presently, but I admit that it may have been due to other causes[1] and not only to malaria.

A statue of "Health-Athena"[2] was set up on the Athenian Acropolis between 429 and 400. The cult was an old one, although there must have been some special reason for this renewal of the worship of the Health-Goddess, and malaria might be the cause just as well as the Plague, with which this statue is usually brought into connexion. Ariphron's famous hymn to Health[3] is of about the same date. Finally, the worship of Asclepius, the god of healing, was introduced into Athens from Epidaurus towards the close of the fifth century. His festivals were *τὰ Ἀσκληπιεῖα*, in March—April (the beginning of the Greek malarial season), and *τὰ Ἐπιδαύρια*, in September (the height of the malarial season).[4] This cumulative evidence tends towards the conclusion that during the period of which we are speaking ill health was distinctly on the increase.[5] It may be objected that a fever patient would be most unlikely to "incubate" in a temple of Asclepius, and certainly there are no such cases recorded among the votive tablets discovered by Cavvadias in the sanctuary at Epidaurus. "The greater number of the illnesses," says that writer, "are those against which medicine is powerless. There are blind men who see, lame who

[1] Any virulent epidemic might leave behind it enfeebled constitutions subject to a great variety of maladies.

[2] Frazer, *Pausanias* ii., 277; Dittenberger, *Sylloge*[2], 585.

[3] Athenaeus, xv., 702. The hymn was renowned for many years (Lucian *Pro lapsu inter sal.* 6). Ariphron was a younger contemporary of Euripides (Pauly-Wissowa, ii. 846).

[4] Girard, *L' Asclépieion d' Athènes*, pp. 40, 50.

[5] It should also be noted that Euripides is particularly fond of using *νόσος*, *νοσῶ*, to describe mental or moral states. Of course, the metaphor is a perfectly natural one, but its special frequency in Euripides seems to demand a special reason.

walk."[1] But nevertheless the chronic maladies that are so often the result of malaria, such as anaemia, derangement of the digestive organs, and dropsy,[2] are likely enough to have brought the sufferers to the temple of the god, in the hope that, where man had failed, the power of heaven might succeed.

With the close of the fifth century and the beginning of the fourth the time is reached when references to fevers become much more numerous.[3] Thucydides is best considered in conjunction with Plato, but Xenophon may well be taken separately.

In Xenophon occurs convincing testimony that in his day it was generally recognised that some diseases are connected, in a special sense, with certain districts. "If," says the father of Cyrus, "you intend to stay some time in one place, you must not neglect the health of your camp. It is an easy matter, if only care be taken. For the inhabitants never cease talking about unhealthy and healthy regions; and their physique and complexions are trustworthy evidence in both cases."[4] Remembering that malaria stunts the growth of its victims, enlarges their spleen, sometimes to an enormous size, and produces a dusky complexion, we conclude that the disease was common and much discussed, and that its tendency to haunt certain localities was perfectly recog-

[1] Cavvadias, *Fouilles d' Epidaure,* vol. i., p. 23.

[2] Dropsy is mentioned in one tablet; Cavvadias, *op. cit.*, p. 28, n. 2; Dittenberger, *Sylloge*[2], 803.

[3] Perhaps the first reference to malaria in Attic literature is Sophocles, *fr.* 466 (Nauck), κρυμὸν φέρων γνάθοισιν ἐξ ἀμφημέρου. This is one of the very few instances, outside medical writings, where an intermittent fever is specifically described. Mention should also be made of Herodicus, a native of Megara, who afterwards lived at Selymbria. He recommended gymnastics and dieting even for fevers, and on this account is severely censured by the writer of *Epidemics*, vi. (Ἡρόδικος τοὺς πυρεταίνοντας ἔκτεινε περιόδοισι κ.τ.λ.). Plato blames him for prolonging useless lives. *Rep.*, 406a. See also *Protagoras*, 316e, and *Phaedrus*, 227d.

[4] Xenophon, *Institutio Cyri*, i., 6, 16.

nised. Troezen had a peculiarly bad reputation, for the speaker in the *Aegineticus* of Isocrates points out the fear with which a party of fugitives approached the place,[1] a fear which was amply justified, seeing that all the exiles (apparently) fell ill, while two of them died.[2] Onchestus in Boeotia was another town notorious for the prevalence of malaria, not unnaturally, as it was situated near the Copaic lake.[3]

The journey of the Ten Thousand across Asia was wonderfully healthy,[4] and nothing is said about malaria, but Chirisophus died through injudicious treatment while suffering from fever,[5] and "fever" by this time was certainly the name of malaria rather than of any other disease. King Agesipolis died of a "violent calenture"[6] which attacked him in the height of summer,[7] soon after he had captured Torone. Finally, Socrates is represented by Xenophon as answering the questioner, who asked if he knew anything good, by the retort, "Good for what? For fever?"[8] Obviously the Athenian of 400 B.C. was familiar enough with the malady.

[1] Isocrates *Aegineticus*, § 22.

[2] The disease was probably malignant malaria. Had it been the only other likely disease, typhoid, the two patients could scarcely have travelled from Troezen to Aegina (§ 25). The amount of malaria in Troezen now varies considerably. See Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 518.

[3] See Meineke *Frag. Com. Graec.* (suppl. to vol. iv.), vol. v., p. ccclxxv. (from *Geogr. gr. min.*, vol. i.). ἱστοροῦσι δ' οἱ Βοιωτοὶ τὰ κατ' αὐτοὺς ὑπάρχοντα ἴδια ἀκληρήματα λέγοντες . . . τὸν πυρετὸν ἐν Ὀγχήστῳ.

[4] Xenophon, *Expeditio Cyri*, v., 3, 3, οἱ δὲ ἄλλοι ἀπώλοντο ὑπό τε τῶν πολεμίων καὶ χιόνος καὶ εἴ τις νόσῳ.

[5] *Ibid.*, vi., 4, 11, Χειρίσοφος μὲν ἤδη ἐτετελευτήκει φάρμακον πιὼν πυρέττων.

[6] Xenophon *Hellenica*, v., 3, 19, καῦμα περιφλεγές.

[7] *Ibid.*, κατὰ θέρους ἀκμήν.

[8] Xenophon, *Memorabilia*, iii., 8, 3, ἆρά γε, ἔφη, ἐρωτᾷς με, εἴ τι οἶδα πυρετοῦ ἀγαθόν; *Ibid.*, iii., 8, 7, πολλάκις γὰρ τό τε λιμοῦ ἀγαθὸν πυρετοῦ κακόν ἐστιν καὶ τὸ πυρετοῦ ἀγαθὸν λιμοῦ κακόν ἐστιν.

In a district where enteric is prevalent, the remark "He has the fever" will, in the mouth of a layman, refer to that disease and not to scarlatina. A medical man, however, would apply the term "fever" to both. Similarly in Greece, although by *πυρετός* physicians might mean any fever, the ordinary public, at least after Aristophanes, generally meant by it the prevalent disease, namely malaria. Thucydides never uses *πυρετός* at all, even when he is describing the feverish symptoms of the Plague. He employs instead *καῦμα* or *θέρμη*,[1] just as though he were afraid of causing misapprehension if he used an expression which, in the common speech, was in his day of a peculiar and limited application. But Galen, the professional man, has no such fears, and when describing the same Plague, uses *πυρετός* twice within a few lines.[2]

Turning now to Plato, who is the first among non-medical writers carefully to distinguish the various kinds of fevers, we find remarkable confirmation of our conclusion that *πυρετός* after Aristophanes has a specific, and not a general, meaning, and in most cases, except in the medical writings, could be translated "malaria." In the *Timaeus,* the date of which is uncertain, but probably falls between 380 and 360 B.C., those diseases which are caused by excess of one element are divided into:—

(*a*) Continuous "calentures" (*καύματα*) and "fevers" (*πυρετούς*), caused by excess of fire (*πῦρ*);

[1] Thucydides, ii., 49. How naturally *θέρμη* or its cognates came to be used for non-malarial feverishness is seen in Menander's **Γεωργός**. As the result of a wound:

βουβῶν ἐπήρθη τῷ γέροντι, θέρμα τε
ἐπέλαβεν αὐτόν, καὶ κακῶς ἔσχεν πάνυ.

[2] Galen, *περὶ διαφορῶν πυρετῶν*, Kühn, vii. 290, *καθά φησιν ὁ Θουκυδίδης. ἀλλ' ἐν καλύβαις πνιγηραῖς ὥρᾳ θέρους διαιτωμένων ὁ φθόρος κατὰ τὸ σῶμα ἐγίνετο. τῷ δ' εἶναι τοὺς ἐν τῷ σώματι χυμοὺς ἐκ μοχθηρᾶς διαίτης ἐπιτηδείους εἰς σῆψιν ἀρχὴ τοῦ λοιμώδους γίνεται πυρετοῦ. τάχα δὲ καὶ κατὰ τὸ ξυνεχὲς ἐξ Αἰθιοπίας ἐρρύη τινα σηπεδονώδη μιάσματα τοῖς ἐπιτηδείως ἔχουσι σώματα βλαβῆναι πρὸς αὐτῶν, αἴτια πυρετοῦ γενησόμενα.*

(*b*) Quotidians (*ἀμφημερινούς*), caused by excess of air;
(*c*) Tertians (*τριταίους*), caused by excess of water;
(*d*) Quartans (*τεταρταίους*), caused by excess of earth.[1]

It is to be observed that Plato's classification is meant to be exhaustive. Classes (*b*), (*c*), and (*d*) give the regular intermittent fevers, which are called by the technical names so common in the medical writers, and so rare everywhere else; class (*a*) contains virulent continuous "calentures," such as the Plague, and continuous "fevers." The word *καῦμα*, then, used by both Thucydides and Plato, may well denote non-malarial fever, but what of "continuous fevers" (*ξυνεχεῖς πυρετοί*)? In the medical writers the phrase denotes any fevers, malarial or non-malarial, that do not intermit; but, as "calenture" obviously covers the non-malarial group, I am of opinion that in Plato the *ξυνεχεῖς πυρετοί* are remittent malarial fevers.[2] It is quite certain that the adjective *ξυνεχής* was at first applied to both a remittent and a continuous fever, so that the use of the term presents no difficulty. Further, if this view be taken, the classification of fevers becomes quite complete.

Class (*a*)... ... ... { (1) Continuous "calentures." (2) Remittent "fevers."
Classes (*b*), (*c*), (*d*) (3) Intermittent "fevers."

At any rate, we may be certain that in the common speech *πυρετός* did not include typhoid, or any such infectious disease. In the *Problems* of Aristotle (?) is propounded the question, "Why is it that those who approach a patient suffering from consumption, ophthalmia or itch, catch the disease, while dropsy, fevers,

[1] 86a, *τὸ μὲν οὖν ἐκ πυρὸς ὑπερβολῆς μάλιστα νοσῆσαν σῶμα ξυνεχῆ καύματα καὶ πυρετοὺς ἀπεργάζεται, τὸ δ' ἐξ ἀέρος ἀμφημερινούς, τριταίους δ' ὕδατος διὰ τὸ νωθέστερον ἀέρος καὶ πυρὸς αὐτὸ εἶναι· τὸ δὲ γῆς, τετάρτως ὂν νωθέστατον τούτων, ἐν τετραπλασίαις περιόδοις χρόνου καθαιρόμενον, τεταρταίους πυρετοὺς ποιῆσαν ἀπαλλάττεται μόγις.*

[2] Malaria is sometimes virtually a continuous fever, and this form will, of course, be included under the term *ξυνεχεῖς πυρετοί*.

apoplexy and the other diseases are not catching?"[1] The word *πυρετοί* did not, at least in the mouth of a layman, include infectious fevers; accordingly it must usually have meant malaria.[2]

The other references to fever in the works of Plato tell us very little, except that it was a common complaint. A passage of the *Phaedo*[3] implies that it was prevalent enough to be chosen to represent the specific diseases, while in the *Lesser Alcibiades*[4] it is classed with gout and "ophthalmia" to show that these three common ailments by no means exhaust the catalogue of sickness. It is unfortunate that in the numerous other places in Plato's writings,[5] where fever is mentioned, the context throws little or no light upon the extent to which malaria was prevalent during the early part of the fourth century. When, however, the other evidence is taken into consideration, it is, perhaps, not rash to conclude that fever was chosen to stand for disease in general because malaria was so familiar to every Athenian. It is likely enough that Plato is copying a peculiarity of the historical Socrates, who may well have appealed to the prevalence among the Athenians of a disease which, as I have tried to show above, was of comparatively recent introduction into Attica.

[1] [Aristotle], *Probl.* vii. 8, *διὰ τί ἀπὸ φθίσεως καὶ ὀφθαλμίας καὶ ψώρας οἱ πλησιάζοντες ἁλίσκονται· ἀπὸ δὲ ὕδρωπος καὶ πυρετῶν καὶ ἀποπληξίας οὐχ ἁλίσκονται, οὐδὲ τῶν ἄλλων;*

[2] Malaria *is* infectious, but owing to the curious way in which the infection is carried, it does not appear to be so.

[3] *Phaedo*, 105c, *οὐδὲ ἂν ἔρῃ, ᾧ ἂν σώματι τί ἐγγένηται, νοσήσει, οὐκ ἐρῶ, ὅτι ᾧ ἂν νόσος, ἀλλ' ᾧ ἂν πυρετός.*

[4] *Alcibiades minor*, 139e 140a.

[5] *Theaetetus*, 178c; *Philebus*, 45b; *Republic*, 610b; *Timaeus*, 84e, 85b, c. In *Republic*, 405c, Plato argues that the function of medicine is not to tend chronic invalids, but to cure wounds and *ἐπέτεια νοσήματα*. Of these "seasonal diseases" malaria is certainly the most striking instance, although among its *sequelae* are many complaints that Plato would have cured by speedy death.

There are many references to fevers,[1] and even to *φρενῖτις* and *λήθαργος*,[2] which are certainly kinds of remittent or continuous malarial fever, in the fragments of the comic poets, but only two of them call for special comment. The first is a fragment of Alexis[3] which shows that "fever" to a Greek generally signified an intermittent; and the other, already quoted above, declares Onchestus to be the most malarious place in Boeotia.[4]

Fever is not often mentioned in the orators. Aeschines tells us that on a certain occasion two cases occurred among the Amphictyons at Delphi.[5] These may, or may not, have been cases of malaria. As Delphi was constantly receiving visitors from all parts of the Greek world, cases of infectious disease must have arisen there. Of a hundred youths, sent by the Chians to Delphi, only two returned; all the rest were killed by pestilence.[6] Such a high rate of mortality points to some disease of the nature of typhus rather than to malaria, and so it would be wrong to infer that Delphi was particularly malarious.

Demosthenes, when he talks of a "period or access of a fever,"[7] shows that in his eyes, at least, *πυρετός*

[1] Nicophon in Athenaeus, iii. 80 ; Antiphanes in Athen. iii. 100 ; Alexis in Athen. iii. 118.

[2] In Stobaeus *Florilegium*, 108, 81 : *πλευρίτιδες, περιπλευμονίαι, φρενίτιδες, στραγγουρίαι, δυσεντερίαι, ληθαργίαι, ἐπιληψίαι, σηπεδόνες, ἄλλα μυρία.* See Meineke, *Frag. Com. Graec.*, iv., p. 320: *Μένανδρος δὲ καὶ τὸν νοσοῦντα λήθαργον λέγει.*

[3] *παπαῖ, ὥσπερ πυρετὸς ἀνῆκεν.*

[4] See p. 40.

[5] Aeschines, 69, *συνέβη δὲ ἡμῖν ἀρτίως μὲν εἰς Δελφοὺς ἀφῖχθαι, παραχρῆμα δὲ τὸν ἱερομνήμονα Διόγνητον πυρέττειν, τὸ δ' αὐτὸ τοῦτο συνεπεπτώκει καὶ τῷ Μειδίᾳ · οἱ δ' ἄλλοι συνεκάθηντο Ἀμφικτύονες.*

[6] Herodotus, vi. 27.

[7] Demosthenes, 118, 20, *ὥσπερ περίοδος ἡ καταβολὴ πυρετοῦ ἤ τινος ἄλλου κακοῦ καὶ τῷ πάνυ πόρρω δοκοῦντι νῦν ἀφεστάναι προσέρχεται.* Harpocration *περίοδος. Δημοσθένης Φιλιππικοῖς φησὶν "ἐπεὶ ὅτι γε ὥσπερ περίοδος ἡ καταβολὴ πυρετοῦ." περιοδικὰ νοσήματα καλοῦσιν οἱ ἰατροὶ τὰ τεταγμένως ἀνιέμενα καὶ αὖθις ἐπιτείνοντα, οἷον τριταίους καὶ τεταρταίους.* See also *s.v. καταβολή.*

usually meant an intermittent fever, but, as might be expected, references to disease are not very common in his works. There is, however, one interesting passage. The speaker is stating the results of a rough handling, and remarks that, although the wounds were not serious in themselves, continuous fevers followed which caused his life to be despaired of; in fact, said the physician, had not haemorrhage occurred, the patient must have died.[1] This may, or may not, be malaria supervening upon severe bodily strain.[2] If it be a case of this disease the fever must have been remittent and not intermittent, since it is called "continuous," and, so far as I know, this adjective is applied to fevers only here, in one passage of Plato, and in the medical writers. In fact it belonged to the technical phraseology of the physicians, and it is plain that in this passage we have the doctor's words reported almost *verbatim*, for the language is everywhere that of the Hippocratic writings.

The references to fever in the works of Aristotle are very numerous. Some of them may be dismissed at once, as they merely show that malaria was not uncommon at the close of the fourth century.[3] But there are other passages which demand fuller treatment. In one place it is said that the term "cause" is used "in

[1] Demosthenes, 1260, 20, *μετὰ ταῦτα δὲ τῶν μὲν οἰδημάτων τῶν ἐν τῷ προσώπῳ καὶ τῶν ἑλκῶν οὐδὲν ἔφη φοβεῖσθαι λίαν ὁ ἰατρός, πυρετοὶ δὲ παρηκολούθουν μοι συνεχεῖς καὶ ἀλγήματα, ὅλου μὲν τοῦ σώματος πάνυ σφοδρὰ καὶ δεινά, μάλιστα δὲ τῶν πλευρῶν καὶ τοῦ ἥπατος, καὶ τῶν σιτίων ἀπεκεκλείμην. καὶ ὡς μὲν ὁ ἰατρὸς ἔφη, εἰ μὴ κάθαρσις αἵματος αὐτομάτη μοι πάνυ πολλὴ συνέβη περιωδύνῳ τ' ὄντι καὶ ἀπορουμένων ἤδη, κἂν ἔμπυος γενόμενος διεφθάρην.*

[2] Cf. Stéphanos, *La Grèce*, p. 496, "Il est aussi à noter qu'il n'est pas rare en Grèce de voir une première manifestation d'une infection palustre déjà latente survenir à la suite d' une maladie fébrile aiguë, d' une hémorrhagie ou d'un traumatisme."

[3] Aristotle, *De part. animal.* 649a, *Eth.*, 1180b, *Parva nat.*, 457a (also a reference to *λήθαργος*, remittent malaria with coma), 460b, 479a; *Meta*, 981a (also a reference to *καῦσος*, remittent malaria or typhoid, if the reading be correct).

the sense in which the moon is called the cause of a solar eclipse, and fatigue the cause of fever."[1] Only in a highly malarious country could it be said, without qualification, that over-exertion will cause fever, because when a person is the subject of latent malaria, any strain will precipitate an attack, and it is for this reason that cases break out in a non-endemic country like England. The infection takes place abroad; the attack occurs at home, weeks, months or even years afterwards. But the most valuable information about malaria is to be found in the pseudo-Aristotelian *Problems*. It is here stated that fevers are most common in summer;[2] that spring and autumn are unhealthy;[3] that damp, marshy places are unhealthy;[4] that a dry summer following upon a rainy period is deadly, especially for children, and that quartans are common at such a time.[5] In another passage[6] consumption, "ophthalmia," and the itch are said to be infectious, fevers non-infectious. We must not assume from this that no infectious fevers were to be found in Greece, because "plague" (λοιμός) is said to attack those who come into contact with a patient,[7] and under this term might well be included typhus, typhoid, and even epidemic malaria; but[8] it certainly may be inferred that the ordinary fevers were malarial. Splenic diseases are mentioned,[9] besides ἠπίαλος[10] and "the burning disease" (καῦσος).[11] Of great

[1] *Parva nat.*, 462b.
[2] *Prob.* i. 6. See also i. 25.
[3] *Prob.* i. 27 and 29.
[4] *Prob.* i. 8 and 21.
[5] *Prob.* i. 19. Cf. i. 22, where it is stated that a plague of toads (a wet season) signifies an unhealthy year.
[6] *Prob.* vii. 8.
[7] *Prob.* i. 7.
[8] This is clear from *Prob.* iii. 26, where the premonitory shivering is mentioned, τῷ ἀρχομένῳ πυρέττειν τὸ γινόμενον ῥῖγος.
[9] *Prob.* ix. 5, διὰ τί αἱ οὐλαὶ μέλαιναι τῶν σπληνιώντων;
[10] *Prob.* xxvii. 2.
[11] *Prob.* i. 20, 29, and xiv. 3.

importance also is the statement that the inhabitants of marshy districts age rapidly.[1] It may be concluded from this evidence that Greece as Aristotle knew it was highly malarious.

The later comic poets afford but little information about the diseases of their time, and the references to malaria that occur in them have already been given.[2] Theophrastus, in his treatise *On Winds*, says that dry south winds bring fevers,[3] and, in the twelfth chapter of the *Characters*, gives as a characteristic of the unseasonable man that "he will serenade his mistress when a fever is upon her."[4] This last quotation proves that malaria was a common complaint at Athens during the early portion of the third century; but from this period onwards there is a gap in our sources, which do not became copious enough to afford much help before the time of Plutarch. The scantiness of the evidence, particularly that dealing with the parts of Greece outside Attica, is a great hindrance to the present enquiry; and it is especially unfortunate that literature is less plentiful just at the time when it is reasonable to suppose that malaria was at its height. But

[1] *Prob.* xiv. 7, οἱ ἐν τοῖς κοίλοις καὶ ἑλώδεσι ταχέως (γηράσκουσι). Other important passages in Aristotle are *Prob.* i. 55—57, *Top.* 123b, *Hist. animal.* 604a. Altogether fever is referred to over thirty times.

[2] See p. 44.

[3] *De ventis*, 57, ξηροὶ καὶ μὴ ὑδατώδεις ὄντες νότοι πυρετώδεις. Cf. Arist., *Prob.* i. 23.

[4] *Characters*, 12, ὁ δὲ ἄκαιρος τοιοῦτός τις οἷος . . . . πρὸς τὴν αὐτοῦ ἐρωμένην κωμάζειν πυρέττουσαν. Another passage showing how malarious some parts (at least) of the Greek world were at this date is Bion, iv. 13 :—

οὐκ ἐθέλω φθινόπωρον, ἐπεὶ νοσέρ' ὥρια τίκτει.

Cf. also Theocritus, xxx. 2 :—

τετορταῖος ἔχει, παιδὸς ἔρως, μῆνά με δεύτερον.

Specific mention of tertians and quartans is rare in non-medical literature.

Alexander possibly died of malaria,[1] and we know that Philopoemen suffered from fever.[2] A character in Bion reminds us that autumn was very unhealthy,[3] and there is no reason to suppose that the remark applied to a few districts only. We are, indeed, told by Strabo that Alexandria, in spite of its site, was free from marsh-fever even in his time.[4] It is to be inferred from this that damp places were generally known to be unhealthy, so that exceptions to the rule were noticed by observers as remarkable phenomena. Very few such exceptions are on record, and the conclusion is inevitable that a considerable part of the Greek world was notoriously malarious. Eretria[5] is mentioned as being unhealthy in the time of Menedemus, who flourished shortly after the death of Alexander.

Among the *Moral Treatises* of Plutarch is included a work the Latin name of which is *De tuenda sanitate praecepta*. It is intended for the use of those who devote themselves to study or politics (137 C), and lays down the rules which must be observed by such if they

[1] Plutarch, *Alex.* 75.

[2] Plutarch, *Phil.* 18. The disturbed state of the country in the third and second centuries B.C. would certainly favour the spread of the disease.

[3] Quoted above.

[4] Strabo, v., pp. 213, 214. *ἔστι μὲν οὖν καὶ τοῦτο θαυμαστὸν τῶν ἐνθάδε, τὸ ἐν ἕλει τοὺς ἀέρας ἀβλαβεῖς εἶναι, καθάπερ καὶ ἐν Ἀλεξανδρείᾳ τῇ πρὸς Αἰγύπτῳ τοῦ θέρους ἡ λίμνη τὴν μοχθηρίαν ἀποβάλλει διὰ τὴν ἀνάβασιν τοῦ ποταμοῦ, καὶ τὸν τῶν τελμάτων ἀφανισμόν.* Cf. *ibid.* xvii., ch. i., § 7 (p. 793), *αἱ μὲν γὰρ ἄλλαι πόλεις αἱ ἐπὶ λιμνῶν ἱδρυμέναι βαρεῖς καὶ πνιγώδεις ἔχουσι τοὺς ἀέρας ἐν τοῖς καύμασι τοῦ θέρους· ἐπὶ γὰρ τοῖς χείλεσιν αἱ λίμναι τελματοῦνται διὰ τὴν ἐκ τῶν ἡλίων ἀναθυμίασιν· βορβορώδους οὖν ἀναφερομένης ταύτης ἰκμάδος, νοσώδης ὁ ἀὴρ ἕλκεται, καὶ λοιμικῶν κατάρχει παθῶν· ἐν Ἀλεξανδρείᾳ δὲ τοῦ θέρους ἀρχομένου πληρούμενος ὁ Νεῖλος πληροῖ καὶ τὴν λίμνην, καὶ οὐδὲν ἐᾷ τελματώδες, τὸ τὴν ἀναφορὰν ποιῆσον μοχθηράν· τότε δὲ καὶ οἱ ἐτησίαι πνέουσιν ἐκ τῶν βορείων καὶ τοῦ τοσούτου πελάγους· ὥστε κάλλιστα τοῦ θέρους Ἀλεξανδρεῖς διάγουσιν.*

[5] Diogenes Laertius, ii. 133. *ἦν δὲ καὶ φιλυπόδοχος καὶ, διὰ τὸ νοσώδες τῆς Ἐρετρίας, πλείω συνάγων συμπόσια.*

wish to keep in health. At first sight it appears to be a sensible but somewhat commonplace series of remarks; but a more careful reading proves that it throws a flood of light upon the hygienic conditions of the period when it was composed. Before proceeding I will give a short analysis of the contents.

It is necessary to keep the hands warm, as chill in the extremities invites fever (123 A). It is useful to accustom the body when in health to the diet which would be necessary in illness, and it should not be thought insufferable to dine unbathed (123 B—D). The body ought to be nourished, as a rule, with simple foods, so that, should an occasion occur when feasting cannot be avoided, no harm results from indulgence. If some high official invite us, or other imperative call come when we are indisposed, it will be less boorish to abstain than to fall into πλευρῖτις or φρενῖτις through false shame (123 E—124 D).

Food and drink are to satisfy hunger and thirst. Dainties should not be consumed merely because they are costly, or because we wish to boast that we have eaten them. The body must not tyrannize over the soul, nor yet the soul over the body, so as to cause over-indulgence. A man should take a pride in his power to abstain. Rich, tempting dishes cause us to eat too much (124 E—126 B).

Pleasure is impossible without health. We are wont to neglect plain living when we are well, and in sickness to lay the blame upon climate (ἀέρας, χώρας), instead of our own intemperance. When ill we should say to ourselves that drinking cold water, or an untimely bath, has deprived us of many pleasures. In this way we are made more careful when in health (126 B—127 B).

Granted that fevers are caused by exertion, heat and chill, too much food increases the liability (127B—D).

The forewarnings given by fever must not be neglected. Some, when they feel an attack coming on,

betake themselves to baths and banquets, lest they fall ill before they have satisfied their desires; others, more refined (κομψότεροι), are ashamed to show that they are unwell, and obey the call of their companions; most men hope that the feeling of uneasiness will pass off. But on the morrow they have to confess to catarrh, fever or colic. Then they will beg the doctor to allow them wine or cold water. All such should remember that the unhealthy body feels no pleasure in the indulgences which caused the trouble (127 D—128 E).

The over-strict diet of one who is always afraid of his health giving way is certainly to be blamed, as it renders the body liable to fall sick, while it makes the spirit timid and unenterprising; but it is also very unwise to wait for those internal pains which are the forerunners of fever before moderating one's desires and appetites. It is necessary also to be on the watch for bad dreams, crossness of temper and melancholy (128 E—129 C).

If a man visit a sick friend enquiry should be made whether it was surfeit, heat, exertion, lack of sleep or wrong diet that caused his fever. His answers will serve as a guide. One should care for one's own mode of life, avoiding all excess (129 D—130 C).

Reading and discussion are excellent physical training. The mockery of inn-keepers or muleteers can be neglected (130 C—131 B).

After exercise, cold baths are to be avoided. Those who so indulge fall ill, unless they follow in the smallest details that strict diet which is so undesirable. It is better to oil the body near a fire (131 B—D).

Meat, dried figs and cooked eggs are not desirable; vegetables, fowl and light fish are to be the staple food. Milk as a drink should be avoided, wine in moderation is good, but not as a " pick-me-up " after exposure; water should be drunk several times a day. If it be

thought a shame to be deprived of food before a fever comes, water may be drunk (131 D—132 F).

While eating, a man should exercise his mind with a book or conversation. This will make him less attracted by the pleasures of the table (133 A—134 A).

Emetics and purges are bad. Dieting is the proper remedy for indigestion. If something must be done, vomiting is the less evil, but violent drugs must be avoided. Drinking water or fasting for a few days may be tried, or even an injection. Most people take refuge at once in strong purgatives, and suffer for it (134 A—F).

On the other hand, a rigid system of fasting is bad. It is absurd to keep well by ceasing to perform the functions of living. Nay, idleness is not healthy (135 A—136 A).

Toil should not be varied by exhausting pleasures. Love of honourable pursuits will drown any desire that is felt for the latter (136 A—E).

A man should learn all he can about his own constitution, what suits it and what does not. It is important that care be taken not to tax it at the change of the seasons (136 E—137 B).

Students must not tax their bodies by too much study, as the many do by worry and exertion at harvest-time. Otherwise they will be compelled to lay aside their books, while they are recovering from a fever (137 C—E).

It will, I think, be admitted that at the period when the treatise was composed there was much ill health. The precepts given by the writer himself are strict, and he distinctly states that there were some who imposed upon themselves such rigid rules of life that health was obtained at far too high a cost; for they could not use it without interfering with those prescribed habits which kept them well.[1]The writer does not seem to be referring to infectious sickness, for he nowhere mentions either

[1] 128e and 131c.

contagion or infection.[1] Indeed, either ancient Greece was singularly free from infectious maladies (other than occasional epidemics) or else the Greeks did not think the danger worth considering. An any rate isolation of the sick, and similar prophylactic measures, were not generally recognised.[2] The great danger, according to Plutarch, was "fever."[3] The symptoms of fever are not described, but a warning is given not to neglect the premonitory signs, and among these are crossness of temper and melancholy.[4] But the risk of falling ill of fever is said to be greatly increased by certain actions or habits. The "causes" of fever include:—

(1) Violent fatigue (*κόπος*).[5]

(2) Extremes of temperature,[6] especially chilled extremities and cold baths at unseasonable times.[7]

(3) Over-indulgence in food and drink.[8]

(4) Insufficiency of rest and sleep.[9]

In addition to these definite dangers, the general tone of the treatise implies a strong recommendation to avoid taxing the body or mind by excess in any form.

With the exception of such prophylactic measures as are the direct result of modern discoveries,[10] this advice is just that which is now given to those who dwell in malarious regions. A glance at any medical work

[1] When calling on a sick friend the visitor is not supposed to take any precautions (129d).

[2] Fumigation by sulphur was known as early as the Homeric period (*Odyssey*, xxii. 481, 493), but the medical writers rarely mention it. Certain skin and eye diseases, with consumption, were regarded as infectious, but not fevers ([Aristotle], *Prob.* vii. 8).

[3] Mentioned several times—123a, 127b, e, 128a, f, 129d, 132e, 137d. Once a more specific name, *φρενῖτις*, is given (124b).

[4] 129c.

[5] 127b, e; 129d.

[6] 127b (*δι' ἐγκαύσεις καὶ διὰ περιψύξεις*), 129d.

[7] 123a, 126f, 127e; cf. also 131c.

[8] 124b, 127c, e, 128a, 129d.

[9] 129d (*ἀγρυπνίαν*), 137d.

[10] E.g., the use of quinine and mosquito-netting.

dealing with tropical diseases will prove the truth of this statement, but as an example a sentence may be quoted from a work by Dr. R. Williams. "Avoid," he says, "exposure to cold, fatigue, improper diet, easterly winds, great mental anxiety."[1] It should also be noticed that the change of the seasons is looked upon as an especially dangerous period,[2] and malaria is most common in Greece during the early autumn. Particular attention should be paid to the difficult passage 137 C,[3] the general drift of which seems to be that poor country-folk constantly fall ill during their exertions at harvest-time. Indigestion and constipation were evidently common complaints when the writer lived, as he tells how the people took refuge in violent purgatives.[4] Now although there are many causes of these stomach complaints, derangement of the digestive organs is the invariable accompaniment of malarial cachexia. If any doubt exists as to the kind of fever to which reference is made, the use of *φρενῖτις*[5] in 124B should dispel it at once. This word is certainly used to denote a very virulent kind of remittent malaria.

It may be concluded with certainty that Greece, or at

[1] *Elements of Medicine*, vol. ii., p. 536.

[2] 137b.

[3] *ὅσα μὲν γὰρ μικρολογίας καὶ ἀνελευθερίας προσκρούσματα λαμβάνουσιν οἱ πολλοὶ περί τε συγκομιδὰς καρπῶν καὶ τηρήσεις ἐπιπόνους, ἀγρυπνίαις καὶ περιδρομαῖς ἐξελέγχοντες τὰ σαθρὰ καὶ ὕπουλα τοῦ σώματος, οὐκ ἄξιόν ἐστι δεδιέναι μὴ πάθωσιν ἄνδρες φιλόλογοι καὶ πολιτικοί.* Compare with this the remarkably similar passage in North, *Roman Fever*, p. 283 (from *Annali di Agricoltura*, No. 77, 1884, p. 53): "It does not require any words to explain under what horrible conditions these unfortunates exist; but things are far worse when one knows that hardly has the harvest begun to show signs of maturity than, in order to protect themselves from theft, frequent in a country so deserted (as the Pontine region), they are driven to take up their abode day and night in the fields without even a hut which might protect them from the cold morning mists, which are never wanting in a district so rich in water."

[4] *φαρμακείας, ἐφ' ἃς οἱ πολλοὶ φέρονται προχείρως*, 134f.

[5] For *φρενιτις* see Littré, *Oeuvres d' Hippocrate*, vol. ii., pp. 538-584.

least Boeotia, in which Plutarch lived, was highly malarious in the first century A.D. Hesiod, it may be remembered, does not mention malaria among the plagues of the Boeotian farmer, but Plutarch has a different tale to tell.[1]

Attica also was malarious, but perhaps not to such a degree as other districts. Aulus Gellius says that he was attacked by fever when on a visit to a country house in Attica.[2] Lucian, who travelled much in various parts of Greece, and resided for some years in Athens, is an excellent witness of the extent to which fever and ague prevailed. It is true that he believed long life could be secured in any climate by proper precautions,[3] but the bare statement of this conviction, when viewed in the light thrown upon the question by other passages, shows how many regions were labouring under the plague of malaria. Fever is held responsible for filling the lower world,[4] and *ἠπίαλος*, the regular Attic name for ague,

[1] Other references to fever in Plutarch are *Moralia*, 100b, 101c (*ἂν μὴ τὰ πάθη τῆς ψυχῆς καταστορέσῃς καὶ τὴν ἀπληστίαν παύσῃς καὶ φόβων καὶ φροντίδων ἀπαλλάξῃς σαυτόν, οἶνον διηθεῖς πυρέττοντι*); 44f, 141b, and about eight passages in the *Lives*. For *ἠπίαλος* 476f, 502a. For *φρενῖτις* 81f, 693a, 1128d.

[2] *Noctes Atticae*, xviii. 10, in Herodis c.v. villam, quae est in agro Attico, loco qui appellatur Cephisiae, aquis et lucis et nemoribus frequentem, aestu anni medio concesseram. ibi alvo mihi cita et accedente febri rapida decubueram.

[3] *Macrobii*, 6 (212), *κατὰ πᾶσαν τὴν γῆν καὶ κατὰ πάντα ἀέρα μακρόβιοι γεγόνασιν ἄνδρες οἱ γυμνασίοις τοῖς προσήκουσι καὶ διαίτῃ τῇ ἐπιτηδειοτάτῃ πρὸς ὑγίειαν χρώμενοι*. This work, even if not Lucian's, is valuable as testimony. It is important to notice that victims of malaria die young ([Arist.], *Prob.* xiv. 7).

[4] *Charon*, 17 (513), *ἄγγελοι δὲ καὶ ὑπηρέται αὐτοῦ μάλα πολλοί, ὡς ὁρᾷς, ἠπίαλοι καὶ πυρετοὶ καὶ φθόαι καὶ περιπνευμονίαι κ.τ.λ.* Cf. *infra πεδήσας τῷ πυρετῷ ἢ τῇ φθόῃ*, and *Cataplus*, 6 (628), *καὶ τοὺς ἀπὸ τοῦ πυρετοῦ. ἠπίαλος* is mentioned in *Philopseudes*, 19 (46), *ἰάσατο διὰ τρίτης ὑπὸ τοῦ ἠπιάλου ἀπολλύμενον* (and *infra ἐπιπέμπειν ἠπιάλους*); *Dissertatio cum Hesiodo*, 8 (246), *ἠπίαλος οὐ μικρὸς ἐπιπεσεῖται τῷ τοιούτῳ*, and *Gallus*, 9 (715), *εὐχόμενος ἅπασι θεοῖς ἠπίαλόν τινα ἢ πλευρῖτιν ἢ ποδάγραν ἐπιπέμψαι τῷ μαλακιζομένῳ ἐκείνῳ*.

figures prominently with consumption, another curse both to ancient and to modern Greece. Before the discovery of quinine, deaths from fever must have been numerous, but as, even when not treated with quinine, malaria has not a very high case-mortality, the evidence of Lucian shows how universal the disease had become. Indeed, the ancient treatment of malaria could have done but little good, and, not unnaturally, faith-cures were much in vogue.[1] Fever is chosen as the typical disease, which attacks even kings,[2] and the virulent form of remittent malaria, called *φρενῖτις*, is mentioned once.[3] Lucian resembles the other Greek writers in that he often calls malaria by the simple name "fever," no further qualification of the word being necessary in a land that is constantly afflicted with the scourge of paludism. Thus he says that the people of Abdera fell sick of fever, and jestingly declares the cause to be their listening to a performance, in the heat of summer, of a tragedy.[4]

This testimony to the highly malarious state of Attica is confirmed by a passage in the *Letters* of Alciphron, the

[1] *Deorum conc.* 12 (534), *ἤδη καὶ ὁ Πολυδάμαντος τοῦ ἀθλητοῦ ἀνδριὰς ἰᾶται τοὺς πυρέττοντας ἐν Ὀλυμπίᾳ καὶ ὁ Θεαγένους ἐν Θάσῳ.* Cf. *Scytha*, 2 (862), *καί φασι πυρεταίνοντάς τινας ἤδη πεπαῦσθαι ὑπ' αὐτοῦ.*

[2] *Navigium*, 40 (274), *νοσεῖς τὰ ὅμοια τοῖς ἰδιώταις καὶ ὁ πυρετὸς οὐ διαγινώσκει σε βασιλέα ὄντα.*

[3] *Convivium*, 20 (433), *ἐβεβραδύκει δέ, ὡς ἔφασκε, φρενίτιδι ἑαλωκότα θεραπεύων.*

[4] *Quomodo historia conscribenda*, 1 (2, 3), *αἰτίαν δέ μοι δοκεῖ τοῦ τοιούτου παρασχεῖν Ἀρχέλαος ὁ τραγῳδός, εὐδοκιμῶν τότε, μεσοῦντος θέρους ἐν πολλῷ τῷ φλογμῷ τραγῳδήσας αὐτοῖς τὴν Ἀνδρομέδαν, ὡς πυρέξαι τε ἀπὸ τοῦ θεάτρου τοὺς πολλοὺς καὶ ἀναστάντας ὕστερον κ.τ.λ.* Cf. *Philopseudes*, 9 (37), *τῶν ἐκ περιόδου πυρετῶν τὰς ἀποπομπάς.* Other references to fever in Lucian are *Abdicatus*, 27 (183), *πάντα πυρετὸν ἢ πᾶσαν φθόην. De morte Peregrini*, 44 (363), *ἑάλω πυρετῷ μάλα σφοδρῷ. Philopseudes*, 25 (52), *ὁ δὲ πυρετὸς οἷος καύσωνος σφοδρότερος.*

contemporary of Lucian, where mention is made of a man attacked by an ague that ended fatally.[1]

The *Sacred Discourses* of Aelius Aristides do not furnish much evidence. There is one explicit reference to a tertian fever,[2] and once or twice symptoms are described which seem to point to malaria,[3] but the details do not permit a positive answer to be given, in spite of the term *πυρετός*.[4] For this word does not always mean malaria, especially when employed by a man familiar with the technical phrases of the physicians. But these *Discourses* imply the existence of a public that would take an interest in detailed descriptions of sickness. Hence illness was probably common, and it would not be rash to conclude that it was very often malarial disease.

The later writers of the Empire help but little towards forming an estimate of the prevalence of malaria. The time when they lived is often uncertain, nor is the district always known to which they refer. But enough evidence exists to make it likely that malaria was never absent. Heliodorus,[5] the novel writer, mentions fever, while Xenophon,[6] another author of the same school, shows

[1] Alciphron, iii. 72, *οὐκ ἔφθη γὰρ τὰ κατ' ἐμὲ ὁ δεινὸς ἐκεῖνος πρεσβύτης τῇ βουλῇ κοινούμενος, καὶ ἠπιάλῳ συσχεθεὶς εἰς τὴν ἕνην ἀπέψυξε.* Notice again the Attic word *ἠπίαλος*.

[2] *ἱερ. λόγ.*, iv. § 59 (520D), *ἔκαμνον γὰρ τριταίῳ οἵῳ βαρυτάτῳ καὶ ὁρῶ Λυσίαν τὸν ῥήτορα, νεανίσκον οὐκ ἄχαριν. ἐπῄει δὲ ἡ τῆς καταβολῆς ἡμέρα καὶ ὁ πυρετὸς οὐκ ἐπεγένετο.*

[3] E.g., *ibid.* iii. §§ 16, 17 (492) (headache, fever, convulsions), and *ibid.* v. § 1 (534).

[4] *Ibid.* i. § 62 (461), ii. § 44 (476), ii. § 62 (481), *καὶ μετ' οὐ πολὺ τὰ σπλάγχνα ᾠδήκει καὶ τὰ νεῦρα κατέψυκτο καὶ φρίκη διέθει διὰ παντὸς τοῦ σώματος καὶ τὸ πνεῦμα ἀπεκέκλειτο . . . . καὶ πυρετοὶ κατέλαβον.*

[5] *Aethiop.* iv., *ζ'*, *τὸ δὲ τῆς κόρης, νόσος μέν, ἀλλ' οὐ σώματος. οὐ γὰρ χυμῶν τις περιττεύει, οὐ κεφαλῆς ἄλγημα βαρύνει, οὐ πυρετὸς ἀναφλέγει.*

[6] *Ephes.* i., *εἰς τέλος εἰσάγουσι παρὰ τὴν Ἀνθίαν μάντεις καὶ ἱερέας, ὡς εὑρήσοντας λύσιν τοῦ δεινοῦ. οἱ δὲ ἐλθόντες ἔθυόν τε ἱερεῖα, καὶ ποικίλα ἐπέσπενδον, καὶ ἐπέλεγον φωνὰς βαρβαρικάς, ἐξιλάσκεσθαί τινας λέγοντες δαίμονας, καὶ προσεποιοῦντο ὡς εἴη τὸ δεινὸν ἐκ τῶν ὑποχθονίων θεῶν.*

how common "faith-cures" and other superstitious methods of treatment must have been. A late Athenian inscription [1] refers to quartan fever, and a similar one has been found in Euboea.[2] Both of these seem to be borrowing the words of the curse in Deuteronomy xxviii. 22. The Orphic poems, which are of uncertain date, mention both tertians and quartans,[3] and recommend the use of the agate as a charm—another instance of superstitious treatment that must not be forgotten in estimating the effects of malaria upon the people at large.

The history of philosophy compiled by Diogenes Laertius contains a few references to malaria in the quotations from previous writers, but, as it is not always possible to state for certain the dates of the latter, this evidence is not so valuable as it might have been. The apocryphal letter from Pherecydes to Thales mentions *ἠπίαλος*,[4] and among the Pythagorean *dicta* it is stated that autumn and evening are unhealthy.[5] Antisthenes, on being reviled for consorting with wicked men, replied that physicians visit the sick, although they themselves have no fever.[6] An Englishman, accustomed to infectious fevers, is tempted to say that the opponents of Antisthenes meant that he was contaminated by his companions. But this is not so; the Greeks did not look upon fevers as infectious. The implied argument is that "birds of a

[1] Dittenberger, *Sylloge*,[2] 890, *καὶ φρείκῃ καὶ πυρετῷ καὶ τεταρταίῳ.*
[2] *Ibid.*, 891, *τοῦτόν τε θεὸς πατάξαι ἀπορίᾳ καὶ πυρετῷ καὶ ῥίγει.*
[3] Λιθικά, 627,—

εἰ δὲ πυριφλεγέθων ἑτερήμερος ἄνδρα θαμίζων
ἢ κρυερὸς μάρπων πυρετὸς παραδηθύνῃσιν
ἠὲ τεταρταίης πῆμα βραδύ, μήποτε λήγειν
βουλομένης, ἀλλ' αἰέν, ὅπῃ πελάσῃσι, μενούσης,
τόνδε σύ γ' ἰᾶσθαι δι' ἀμύμονος ἀντιαχάτου·
οὗτος γὰρ πυρετῶν πολὺ φέρτερος.

[4] Diog. Laert. i. 122, *καί με εἶχεν ἠπίαλος.*
[5] *Ibid.* viii. 26, *φθινόπωρον νοσερόν . . . . τὴν ἑσπέραν νοσερωτέραν εἶναι.*
[6] *Ibid.* vi. 6, *ὀνειδιζόμενός ποτε ἐπὶ τῷ πονηροῖς συγγενέσθαι, καὶ οἱ ἰατροί, φησί, μετὰ τῶν νοσούντων εἰσίν, ἀλλ' οὐ πυρέττουσιν.*

feather flock together;" if Antisthenes had base companions, he himself also was base. The philosopher replies by urging that the proverb does not always hold good; physicians (and he was a physician of souls) visit fever patients, but this does not mean that they are feverish themselves.

References to fever are found down to the latest Greek authors. Tzetzes [1] mentions it once or twice; in one passage he uses λήθαργος [2] and in another καῦσος,[3] both of which terms signify remittent or sub-continuous malaria.

It must not be supposed that all the references to πυρετός that have been given in this chapter are to be taken in the sense of intermittent or remittent fever. But careful note should be taken of the fact that, where it is possible definitely to state what kind of fever is meant, it is in most cases malaria. When Demosthenes speaks of the "period of a fever," when Aristotle gives fatigue as the " cause " of fever, and says that the attack is ushered in by shivering, no reasonable doubt can exist as to the malarious nature of the disease. There is in fact scarcely an instance of fever among all the quotations that have just been given which could be diagnosed as certainly non-malarial. This being so, it can be asserted confidently that throughout Greek history, at least after Aristophanes, malaria was so prevalent as to be designated in the common speech by the unqualified term πυρετός.

In conclusion, it may be affirmed, from the evidence of the non-medical literature, that malaria was endemic

[1] *Chil.* xiii. (*Hist.* 459), περὶ τοῦ Ἡρώδου νοσήματος, 24, δεινῷ τῷ πυρετῷ.

[2] *Letters*, 21, οὔτε ὁ Φειδίας οὔτε ὁ Τζέτζης νενόσηκε παραπληξίαν ἢ λήθαργον.

[3] *Ibid.* 95, πυρετοῖς καύσοις. In *Chil.* viii. (*Hist.* 234), 875 foll., mention is made of μελαγχολία and its evil effects upon morals. This term often refers to the melancholia which may ensue upon malarial cachexia.

throughout the greater part of the Greek world by 400 B.C. It is very probable that there was a severe outbreak in Attica during the Peloponnesian War, and it is at least likely that the disease was common in Magna Graecia and on the coast of Asia Minor as early as 500 B.C. But there is only the slightest evidence that malaria existed on the mainland of Greece in early times.[1] The references to *πυρετός* in Homer, and to *ἠπίαλος* in Theognis, are of doubtful meaning. After Aristophanes, however, *πυρετός*, in the non-medical literature, nearly always means malaria.

[1] It has been supposed that some of the labours of Heracles refer to works undertaken to diminish malaria, and the Greek Anti-malaria League has taken as its emblem Heracles killing the hydra—certainly a most apt choice. The question could be argued without much profit, but one of the most pertinent references (Philostratus, *τὰ ἐς τὸν Τυανέα Ἀπολλώνιον*, viii. 7, p. 159) is important, as it shows that Elis was a malarious site: *Ἡρακλέους μὲν γὰρ Ἀποτροπαίου ἐστί, ξυνεργὸν δ' αὐτὸν εἰλόμην, ἐπειδὴ σοφός τε καὶ ἀνδρεῖος ὢν ἐκάθηρέ ποτε λοιμοῦ τὴν Ἦλιν τὰς ἀναθυμιάσεις ἀποκλύσας, ἃς παρεῖχεν ἡ γῆ κατ' Αὐγέαν τυραννεύοντα.* Cf. Strabo, viii., p. 346.

CHAPTER III.

Malaria in the Medical Writers.

Up to the present only the non-medical writings have been discussed. The difficulty in diagnosing the diseases mentioned in them consists in the vagueness of the nomenclature; specific names or detailed descriptions are comparatively rare. In interpreting the medical writers the difficulties encountered are of a different kind. Specific terms are common enough, but they do not always correspond to modern equivalents. The Greek physician classified diseases according to their symptoms; the modern custom is, when possible, to classify them according to the micro-organisms that are their primary cause.[1] It is distinctly the exception to find, in the old Greek treatises, that the writer accounts for a disease in the same way as a modern scientist would account for it. The doctrines of "humours" and "elements" form the framework into which doctors were wont to fit their notions of the origin of diseases. There are, however, important exceptions. It was well known that marshy districts were unhealthy, and that over-fatigue or self-indulgence tended to precipitate an attack of fever. But on the whole it is true that the historian is not much helped in the task of diagnosis by the so-called "causes" to which the Greeks traced the origin of disease.

Many of the Greek medical writers copied their predecessors without any acknowledgment of the debt; the idea of literary copyright did not then exist. In this manner there is introduced an element of uncertainty that

[1] This statement does not apply to many diseases, particularly those of nervous origin, which even now admit of being classified only symptomatically.

may easily deceive the unwary, for if it be known that any particular writer borrowed from another, it must not be assumed that the diseases he mentions or describes were common in the district where he lived. It is probable that the history of " intermittents " in England has been hopelessly confused through the custom of our sixteenth-century physicians, who applied the nomenclature of Galen to English diagnosis in a most unwarrantable fashion.[1] I am unable to satisfy myself of the extent to which malaria existed in England during the Anglo-Saxon period, just because our chief evidence [2] seems to be derived from a translation or adaptation of Greek originals. Fortunately we have for classical times trustworthy evidence in the Hippocratic *Corpus,* and scepticism does not become justified until we reach the Graeco-Roman period.

The object of my enquiry is not to discuss fully the multiplicity of forms malaria exhibits in the old medical writings; a treatise, of interest to none but specialists, could be written about most of these. It will be sufficient for my present purpose to form a rough estimate of the prevalence of malaria by examining the chief passages which treat of intermittent, remittent and pernicious fevers, and of malarial cachexia.

The works which are included in the Hippocratic *Corpus* were written at various times and by various authors. It has been thought that certain of the writings, the *Coan Prognostics* and the first *Prorrhetic,* were compiled from inscriptions on votive offerings in the temple of Asclepius at Cos. The discoveries made by Cavvadias at Epidaurus do not afford any support to this view; but nevertheless it is clear that these writings,

[1] See Creighton, *History of Epidemics in Britain,* vol. ii., p. 301.

[2] Translated by Cockayne, *Leechdoms, Wortcunning, and Starcraft of Early England* (Rolls Series). References to malaria will be found on pp. 23, 41, 55, 59, 61, 65, 85, 145, of vol. i.

as well as others of the *Corpus*, imply a fairly long medical tradition behind them. Hence it is practically certain that malaria was known in the medical schools before Hippocrates, who was born about 460 B.C. This conclusion is borne out by the evidence cited in the previous chapter; still it must be remembered that the disease may have been common enough in Asia Minor but unknown in Attica and other parts of Greece. The ancient Greeks, keeping themselves secluded in their little city-states, were not very likely to spread infection from one to another. Although it is impossible to fix the date of the earliest Hippocratic writings (for even if Hippocrates wrote out the *Coan Prognostics* himself it is probably a mere compilation) the latest of them appears to have been written before the time of Aristotle.

The malarial fevers are mentioned again and again in the Hippocratic collection, so often in fact that a glance over a few pages is enough to convince any reader that they were among the most common diseases with which the Greeks were acquainted. In the first book of the *Epidemics* fevers are divided into (1) continuous (συνεχέες); (2) quotidians; (3) semi-tertians (ἡμιτριταῖοι); (4) tertians (τριταῖοι); (5) quartans (τεταρταῖοι); (6) quintans (πεμπταῖοι); (7) septans (ἑβδομαῖοι); and (8) nonans (ἐναταῖοι).[1] Hippocrates mentions the severity of continuous fevers, which must have included remittent malaria, and rightly remarks that of all fevers the quartan is at once the

[1] Kühn, iii., pp. 408, 409; Kühlewein, i., pp. 200, 201. We find that in the next century the existence of quintans, septans, and nonans was denied. The recognition of these fevers by Hippocrates may be due to lack of experience. If so, malaria was a comparatively new disease to his immediate predecessors. It would be wrong to lay stress upon a doubtful point, but Major R. Ross, to whom I have written for an opinion, says: "I think your argument about the passage in Hippocrates is quite sound. It has often been stated by those without much experience that malarial fever has longer intervals than the common ones." But Hippocrates may have been thinking of non-malarial fevers, in which case the argument falls to the ground.

longest and the least dangerous. The semi-tertian, which was almost certainly the malignant tertian, single or double, is also characterized as being of a particularly fatal nature. The malignant tertian seems to be fully described earlier in the same book,[1] where the writer speaks of a fever which never wholly intermits, but "after the nature of tertians" (*τριταιοφυέα τρόπον*) becomes less severe on alternate days. The beginning of the attack is mild, but gradually the fever becomes more severe. There is a slight halt, and then the paroxysms become worse than ever. All the distressing symptoms of fever are felt in a specially painful fashion. Hippocrates was familiar with *ἡπίαλος*,[2] and in the book *On Crises* [3] mention is made of a curious fever, apparently quotidian, called *λιπυρία*, which turned into *ἡπίαλος* and lasted forty days.[4]

There is another classification of fevers in the treatise *On the Nature of Man*,[5] which, according to Aristotle, was written by Polybus, the son-in-law of Hippocrates. The division in this case is fourfold—*σύνοχος*,[6] *ἀμφημερινός*, *τριταῖος*, *τεταρταῖος*. The most interesting remark in

[1] Kühn, iii., pp. 390, 391; Kühlewein, i., pp. 186, 187. I ought, perhaps, to mention the *πυρετοὶ ἐφήμεροι*, or fevers lasting for a day or two only, which are referred to in the *Aphorisms* (Kühn, iii., p. 735). These would include feverish chills, and also what the modern resident in malarious countries would call "touches of fever."

[2] Kühn (*περὶ ἀέρων κ.τ.λ.*), i., p. 527; Kühlewein, i., p. 36.

[3] Kühn, i., p. 139; Littré, ix., p. 280.

[4] Adams (*Paulus Aegineta*, i., p. 252) says that later writers describe *ἡπίαλος* as a fever in which the patient feels hot inside and cold out, while *λιπυρία* is one in which he feels hot outside and cold in.

[5] Kühn, i., pp. 369, 370; Littré, vi., pp. 66, 68.

[6] Here probably the same as *συνεχής* in Hippocrates. *i.e.*, both continuous and remittent fever might be so described. Galen (Kühn, xix., pp. 398, 399) defines *πυρετὸς συνεχής* as a fever which does not intermit, although it may remit: *πυρετὸς σύνοχος*, on the contrary, remains at a constant height without remission or exacerbation.

the passage is to the effect that the age most liable to quartans is from the twenty-fifth to the forty-fifth year.

Remittent fevers would come under the general head of *συνεχεῖς πυρετοί*, but there were certain special forms that were evidently very common in the time of Hippocrates, and were called *καῦσος*, *φρενῖτις* and *λήθαργος*. Much controversy has raged about the meanings of these terms, and although in all probability it will never be possible to solve the whole problem, yet Littré [1] pointed out the way to an approximately correct solution when he insisted that the diseases denoted by these three words must be identified, not with those prevalent in northern climates, but with those common in Greece at the present day.

The "burning disease" (*καῦσος*) owed its name to the feeling of intense heat [2] experienced by the patient. Probably no fever is mentioned so frequently in the Hippocratic collection, and it must have been peculiarly prevalent at the time of Hippocrates and afterwards. The symptoms [3] show a remarkable likeness to those of typhoid, and excellent clinicians whom I have consulted on the matter are confident that the disease was, in some cases at least, allied to our enteric. Certainly if enteric existed then it would often be called *καῦσος*, but there are many excellent reasons why this term must have included other fevers as well. In the first place, typhoid rarely completes its course so soon as this disease

[1] *Oeuvres d' Hippocrate*, ii. pp. 530-592.

[2] Galen, Kühn, xix., p. 399.

[3] See Hippocrates, Kühn, ii., pp. 65, 66; Kühlewein, i., pp. 146, 147. There is an excellent account of *καῦσος*, *φρενῖτις* and *λήθαργος* in the *Dictionnaire encyclopédique des Sciences médicales*. The view there adopted is that of Littré. Hippocrates regarded *καῦσος* and *φρενῖτις* (and perhaps *λήθαργος*) as akin. See *Epidemics*, iii. (Kühn, iii., p. 488), *κωματώδεες δὲ μάλιστα οἱ φρενιτικοὶ καὶ οἱ καυσώδεες ἦσαν.*

frequently did.[1] Furthermore, *καῦσος* had remissions, and sometimes was the reverse of fatal.[2] Nevertheless, it was accounted an "acute" disease,[3] and caused, directly or indirectly, a considerable number of deaths.[4]

The conclusion of Littré is that *καῦσος* is to be identified with remittent or sub-continuous malarial fever. Stéphanos agrees, but is well aware how impossible it is to be sure that typhoid must be excluded.[5] There is, however, one difficulty which needs clearing away. Malaria, in Greece at least, is above all things a summer illness, but Hippocrates clearly asserts that *καῦσος* often occurred in winter.[6] It must not, however, be supposed

[1] [Hippocrates], Kühn, i., p. 139; Littré, ix., p. 280, *οἱ δὲ λοιποὶ ἀσφαλέες παύονται καῦσοι ἑβδομαῖοι ἢ τεσσαρεσκαιδεκαταῖοι.* Cf. also the next note, and Kühn, ii., p. 389; Littré, vi., p. 218, *κρίνεται δὲ ἡ μὲν βραχυτάτη ἐνάτῃ [ἢ δεκάτῃ], ἡ δὲ μακροτάτη τεσσαρεσκαιδεκάτῃ.*

[2] Hippocrates (*Ep.* i.), Kühn, iii., p. 389; Kühlewein, i., p. 185, *ἔκρινε τούτοισι πάνυ εὐτάκτως, τοῖσι πλείστοισι σὺν τῇσι διαλειπούσῃσιν ἐν ἑπτακαίδεκα ἡμέρῃσιν, οὐδὲ ἀποθανόντα οὐδένα οἶδα τότε καύσῳ,* and Kühn, ii., p. 389, *ἢν μὲν μεταστῇ ἐς περιπλευμονίην, ὀλίγοι διαφεύγουσιν· ἢν δὲ μὴ μεταστῇ, διαφεύγουσι πολλοί.* Cf. Leo the Sophist (Ermerins, p. 99), *οἷον τριταῖος συνεχής, ὃς καὶ καῦσος λέγεται.*

[3] Kühn, ii., p. 27; Kühlewein, i., p. 111, *ἔστιν δὲ ταῦτα ὀξέα, ὁποῖα ὠνόμασαν οἱ ἀρχαῖοι πλευρῖτιν καὶ περιπνευμονίην καὶ φρενῖτιν καὶ καῦσον, καὶ τἄλλα ὅσα τούτων ἐχόμενα, ὧν οἱ πυρετοὶ τὸ ἐπίπαν συνεχέες. ὅταν γὰρ μὴ λοιμώδεος νούσου τρόπος τις κοινὸς ἐπιδημήσῃ, ἀλλὰ σποράδες ἔωσιν αἱ νοῦσοι, καὶ πολλαπλάσιοι ὑπὸ τούτων τῶν νοσημάτων ἀποθνήσκουσι [πλείους] ἢ ὑπὸ τῶν ἄλλων τῶν συμπάντων.*

[4] See the latter sentence of the quotation in (3).

[5] Stéphanos, *op. cit.*, p. 498, "Toutefois il paraît presque certain qu' avec ces fièvres on confondait d' autres maladies, peut-être même la fièvre typhoïde, dont pourtant l'existence pendant l' antiquité, à cause de la malaria même, est extrêmement difficile à démontrer."

[6] Hippocrates, Kühn, i., p. 533; Kühlewein, i., p. 41, *τοῦ δὲ χειμῶνος τοῖσι νεωτέροισι μὲν περιπνευμονίαι τε καὶ μανιώδεα νοσεύματα, τοῖσι δὲ πρεσβυτέροισι καῦσοι διὰ τὴν τῆς κοιλίης σκληρότητα.* Kühn, i., p. 545, Kühlewein, i., p. 51, *ἢν δὲ τὸ θέρος ἔπομβρον γένηται καὶ νότιον καὶ τὸ μετόπωρον, (τὸν) χειμῶνα ἀνάγκη νοσερὸν εἶναι καὶ τοῖς φλεγματίῃσι καὶ τοῖς γεραιτέροισι τεσσαράκοντα ἐτέων καύσους γίνεσθαι εἰκός.*

that this was a universal rule. On the contrary, it is expressly stated in the *Aphorisms*[1] that continuous fevers, καῦσοι, tertians and quartans are diseases of summer; while according to the author of the treatise *On Affections*[2] the acute diseases occur both in summer and in winter, less frequently, however, and with less severity[3] in the former case than in the latter. Perhaps the true explanation lies in the fact that the malarial season is not at the same time of the year throughout the whole of Greece, and that in certain places it does not begin before August or September. Thus at Aegion[4] (Vostitza) the beginning is sometimes in September, the height in October and the decline in February; in Sparta[5] epidemics may occur from mid-September to November.

The most marked characteristics of φρενῖτις were pain in the hypochondria (particularly in the region of the liver) and delirium.[6] It was an "acute" disease, and usually ended in death on the third, fifth or seventh day;[7] the final crisis came on the seventh, or not later than the eleventh,[8] day from the beginning of the attack. Galen,[9] in his commentaries on Hippocrates' *Aphorisms*, says that it generally had a tertian periodicity. From the

[1] Kühn, iii., p. 724.

[2] Kühn, ii., p. 385; Littré, vi., p. 214.

[3] I venture to suggest that the late autumn cases may have included some typhoid.

[4] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 433.

[5] *Ibid.*, pp. 438, 439.

[6] [Hippocrates], Kühn, ii., p. 299, (περὶ νούσων τὸ τρίτον); Littré, vii., p. 128, πάσχουσι δὲ τάδε· τὰς φρένας ἀλγέουσι; Kühn, ii., p. 387 (περὶ παθῶν); Littré, vi., p. 216, φρενῖτις ὅταν λάβῃ, πυρετὸς ἴσχει βληχρὸς τὸ πρῶτον καὶ ὀδύνη πρὸς τὰ ὑποχόνδρια· μᾶλλον δὲ πρὸς τὰ δεξιὰ ἐς τὸ ἧπαρ.

[7] Kühn, ii., p. 300, ἡ δε ιοῦσος θανατώδης· ἀποθνήσκουσι γὰρ τριταῖοι ἢ πεμπταῖοι ἢ ἑβδομαῖοι.

[8] Kühn, ii. 388.

[9] Kühn, xvii. b, p. 385, καὶ οἱ παροξυσμοὶ δὲ πλευρίτιδι μὲν καὶ φρενίτιδι διὰ τρίτης ὡς τὰ πολλά.

prominent place occupied by it in the Hippocratic collection it probably was common enough; there are references even in non-medical literature. Without altogether excluding typhoid,[1] or the curious mixture of typhoid and malaria called "typho-malaria," to which it bears a remarkable resemblance,[2] we may safely diagnose φρενῖτις as pernicious malaria of the cerebral or typhoidal type.

The chief characteristic of λήθαργος was irresistible coma.[3] It was generally fatal, occurred chiefly in winter,[4] and attacked adults.[5] Here perhaps a confident diagnosis would be unwise, but the disease bears a strong likeness to the comatose form of pernicious malaria.[6]

It is most uncertain whether blackwater fever is referred to in the ancient medical writings. A theory is at present much in vogue that traces its origin, at least in many cases, to the use of quinine, with which the Greeks were certainly unfamiliar. Black urine (μελανα οὖρα)[7] is mentioned several times by Hippocrates, but one of our best authorities on the disease assures me that the cases described in the first book of the *Epidemics* cannot be blackwater fever. Stéphanos,[8] who gives an excellent summary of the history of the

[1] Littré (ii., p. 572) warns us that φρενῖτις was a disease and not a mere symptom; but it surely may have denoted more than one disease, provided that the symptoms justified the name. See Stéphanos, *op. cit.*, p. 498.

[2] See Woodward, *Typho-malarial Fever, is it a special type of fever?* Philadelphia, 1876.

[3] See [Hippocrates], Kühn, i., p. 252; Littré, v., p. 610; Kühn, ii., pp. 281, 296; Littré, vii., pp. 100 and 122.

[4] Kühn, iii., p. 724. τοῦ δὲ χειμῶνος λήθαργοι. Littré, however, omits λήθαργοι.

[5] Kühn, iii., p. 726. ὑπὲρ τὴν ἡλικίην ταύτην [sc. νεηνίσκοισι] . . . λήθαργοι.

[6] See Kouzis in Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 101.

[7] In blackwater fever the urine is not really black, but "port-wine" colour.

[8] *Op. cit.*, p. 500.

disease in Greece, will not commit himself to a definite statement whether or not it was known to Hippocrates.

But if there is doubt about the early existence of blackwater fever, it is quite certain that Hippocrates was perfectly familiar with malarial cachexia. Nothing could be clearer than the full and repeated descriptions to be found in the treatise *Airs, Waters, Places*. So large a part of the book is taken up by accounts of this miserable condition, that the reader is forced to conclude that as early as 400 B.C. a large part of Greece was highly malarious.

There is a passage in the treatise *On Affections* where bilious sufferers from large spleens are said to be evil-complexioned, ulcerous and emaciated; their breath is foul and they are the victims of constipation.[1] This is an excellent description of malarial cachexia, and with it should be compared the account in *Airs, Waters, Places* of those who drink the water of marshy districts.[2] They are said to have large spleens, but thin faces and shoulders. Dropsies [3] of a fatal character are common. In summer occur dysentery, diarrhoea, long quartans and then dropsy. In winter the younger people suffer from *περιπνευμονίαι* and *μανιώδεα νοσεύματα*; the older men from *καῦσοι*. The birth-rate is affected by the physical condition of the women. The inhabitants are short-lived.[4] Towards the end of the same work there is a description of those who dwell in low, meadowy

[1] [Hippocrates], Kühn, ii., p. 396.

[2] Kühn, i., pp. 532-534; Kühlewein, i., pp. 40-42.

[3] A very frequent result of chronic malaria.

[4] With this description cf. Kühn, i., pp. 526, 545; Kühlewein, i., p. 51 (there is some divergence here between the two texts), *ὁκόσαι δὲ ὕδασί τε ἑλείοισι χρέονται καὶ λιμνώδεσι κέονταί τε μὴ καλῶς τῶν πνευμάτων καὶ τοῦ ἡλίου, αὗται δὲ μᾶλλον* [sc. *αἰσθάνονται τῶν τοιούτων μεταβολέων*]. *κῆν μὲν τὸ θέρος αὐχμηρὸν γένηται, θᾶσσον παύονται αἱ νοῦσοι· ἢν δὲ ἔπομβρον, πολυχρόνιοι γίνονται· καὶ φαγεδαίνας κίνδυνος ἐγγίνεσθαι ἀπὸ πάσης προφάσιος, ἢν ἕλκος ἐγγένηται. καὶ λειεντερίαι καὶ ὕδρωπες τελευτῶσι τοῖσι νοσεύμασιν ἐπιγίνονται.*

(λειμακώδεα) and hot districts, where the winds and waters are warm.[1] These people are said to be neither tall nor well-built, but stout, fleshy, dark-haired,[2] dark-coloured and bilious. By nature (φύσει) they are neither courageous nor of great powers of endurance, although good institutions (νόμος) may produce these virtues in them.[3] Not only is this passage a faithful portrait of malarial cachexia, but it also shows that acute observers were well aware, even in the time of Hippocrates, of the evil effects of malaria upon the character of those who are continually exposed to its influence.

The inference to be drawn from the Hippocratic collection is that the Greeks of 400 B.C. were perfectly familiar with intermittent fevers, remittent fevers, various pernicious types of malaria and malarial cachexia.

Of Alcmaeon and the other predecessors of Hippocrates practically nothing is known, but of his successors, Diocles of Carystus (350 B.C.), Praxagoras of Cos (335 B.C.) and many other famous physicians belonging to the various schools, are sometimes

[1] Kühn, i., pp. 566, 567 ; Kühlewein, i., pp. 68, 69.

[2] I should like to throw out the suggestion, although I am not ignorant of the flimsy nature of the evidence, that malaria tended to eliminate the fair Northern strain to which the Greeks seem to have owed their best qualities. This is the view of Major R. Ross, and it is at least perfectly in agreement with the statement in the text as to the dark hair of the dwellers in malarious places. The epithet "dark-coloured" must not be used as evidence in this connexion, since malaria produces a dusky discoloration of the skin, even in a fair patient; but it is more than likely that malaria fell less heavily upon the dark-haired element in the Greek race, which represented the primitive inhabitants of the country. This view fits in admirably with the theory of Professor Ridgeway.

[3] With this should be compared the remedies, namely careful nurture and good institutions, that Plato proposed in order to counteract vices (crossness, melancholy, rashness, cowardice, forgetfulness and stupidity), which in his opinion were due to ill-health. See *Timaeus*, 87b. I suspect that the similarity of the two passages is not accidental.

referred to in the works of later writers. Diocles[1] was the author of a work *On Fevers*. His definition of fever is recorded by Galen,[2] and he seems to have denied the existence of fevers having a longer periodicity than the quartan.[3] Praxagoras knew ἡπίαλος,[4] and declared that certain fevers were more fatal when the patient was between the ages of twelve and seventeen.[5] A liberal diet of flesh and wine was prescribed for sufferers from fever by Petronas of Aegina,[6] and Heraclides of Tarentum (230 B.C.) was much praised for his treatment of φρενῖτις.[7] The Greek physicians who came to Rome paid great attention to φρενῖτις and λήθαργος;[8] Agathinus of Lacedaemon (90 A.D.) wrote a special treatise on semi-tertians;[9] while Archigenes of Apamea, an able physician as well as surgeon, not only was familiar with the semi-tertian but also wrote ten books on fevers.[10] Of the work of Aretaeus, a physician who stood apart from the medical controversies of this period, a considerable portion is still extant. He wrote in Ionic Greek, and is famous for his graphic descriptions of disease, which perhaps excel even those of Hippocrates. He tells us that splenic diseases are rife in marshy

[1] See Wellmann, *Fragmentsammlung der griechischen Aerzte. Band* i., p. 156.

[2] Kühn, xix., p. 343, Διοκλῆς δέ φησιν ἐπιγένημα εἶναι τὸν πυρετόν.

[3] See Wellmann, *loc. cit.*

[4] Galen, Kühn, vii., p. 347.

[5] See the article Τινὰ περὶ ἐλειογενῶν πυρετῶν by Kouzis in Ἡ ἐλονοσία ἐν Ἑλλάδι, p. 103.

[6] Galen, Kühn, i., p. 144; xv., p. 436.

[7] Withington, *Medical History*, p. 67.

[8] See Tsintsiropoulos, *La Médecine grecque depuis Asclépiade jusqu'à Galien*, ch. vi.

[9] Galen, Kühn, xvii.a, pp. 120, 942 foll.; vii., p. 367.

[10] Galen, Kühn, vii., p. 365; ix., p. 669.

countries,[1] and that children are most subject to them.[2] There is also a long passage dealing with the treatment of *φρενῖτις* and *λήθαργος*,[3] while his vivid account of *καῦσος*[4] has always been greatly admired. The compiler Stobaeus has preserved for us several excerpts from the works of Antyllus, who wrote, among other things, treatises on hygiene, the character of different airs, and the like. It is plain enough that the writer lived when malaria was universal and in some places severe. He states roundly that "the late afternoon is unhealthy, like autumn, and so is the early part of the night."[5] The unhealthiness of autumn must surely refer to malaria, and the evening is a dangerous time in malarious countries because it is then that the mosquitoes come out from their hiding-places and bite. In another passage it is said that a high elevation increases healthiness,[6] but marshy districts are always unhealthy and in summer pestilential.[7]

The special treatises on fevers, and on particular kinds of fever, which were written between the date of the Hippocratic collection and that of Galen, are typical of the tendency in Greek medicine to favour the minute subdivision of diseases. Galen, who practised at Rome, and is therefore not a very trustworthy authority for Greek malaria, distinguishes carefully between continuous

[1] Kühn, p. 113; Ermerins, p. 99; Adams, p. 81.

[2] Kühn, p. 112; Ermerins, p. 98; Adams, p. 80.

[3] Kühn, pp. 186-200 (*φρενῖτις*), 200-208 (*λήθαργος*); Ermerins, pp. 159-169 and 169-175; Adams, pp. 133-142 and 143-148.

[4] Kühn, pp. 41-43; Ermerins, pp. 36 foll.; Adams, pp. 31-33.

[5] Stobaeus, *Florilegium*, 101, 15, *νοσερᾶς οὔσης τῆς δείλης, ἀνάλογον φθινοπώρῳ. τῆς δὲ νυκτὸς τὰ μὲν πρῶτα καὶ τὰ περὶ τὴν ἑσπέραν ὅμοια τῇ δείλῃ.* Cf. the Pythagorean *dicta* in Diogenes Laertius, viii., 26, *φθινόπωρον νοσερόν. . . . . τὴν ἑσπέραν . . . . νοσερωτέραν εἶναι.*

[6] *Ibid.*, 101, 18, *οἱ ὑψηλοὶ τῶν τόπων ὑγιεινότεροι.*

[7] *Ibid.*, *οἱ δὲ ἑλώδεις κακοὶ μὲν ἀεί, θέρους δὲ καὶ λοιμώδεις.*

and sub-continuous fevers,[1] and his account of the intermittents is marked by a desire to classify them according to the presence or absence of all the symptoms. So we have "exquisite" tertians and "bastard" tertians.[2] Mixed and double infections are clearly recognised,[3] and a most excellent description is given of a malarial attack.[4] It is unfortunate that so copious a writer does not throw much light upon malaria in Greece, but it is to Galen that we owe our knowledge of many of his predecessors. Possibly the most interesting information he gives is that quotidians usually attack very young children,[5] tertians young men,[6] and semi-tertians (which we are told were common in Rome[7]) men in the prime of life.[8]

The influence of Galen is very noticeable in his successors, Oribasius of Pergamus, the friend of the Emperor Julian; Aëtius[9] of Amida, who was a Count at the Byzantine court in the sixth century; Alexander[10] of Tralles, the contemporary of Aëtius; Paulus of Aegina, a physician of the next century, and Palladius, who has left a treatise on fevers. Full and classified descriptions of malarial fevers occupy a prominent position in the works of these writers, but it is quite impossible to say how far their lengthy accounts are due to the prevalence of malaria, how far to their habit of copying, and how far to mere spinning of theory.

[1] See Kühn, xix., pp. 398, 399, and Kouzis in Ἡ ἑλονοσία ἐν Ελλάδι, p. 105.

[2] *ἀκριβεῖς* and *νόθοι*.

[3] See especially Kühn, vii., pp. 476, 477.

[4] *περὶ τῶν ἐν ταῖς νόσοις καιρῶν*, Kühn, vii., pp. 413 foll., and *περὶ διαφορῶν πυρετῶν*, Kühn, vii. pp. 371 foll.

[5] Kühn, xi., p. 23, *παῖδες δὲ καὶ μάλιστα οἱ μικρότεροι . . . . ἀμφημερινοῖς εὐάλωτοι.*

[6] Kühn, xvii.b, p. 642.

[7] Kühn, vii., p. 435.

[8] Kühn, vii., p. 468.

[9] See book v., *περὶ τῆς τῶν πυρετῶν διαγνώσεως καὶ θεραπείας.*

[10] See *περὶ πυρετῶν*, Puschmann, Bd. i., pp. 291-439, and note especially the quaint charm for a quartan fever on p. 437.

CHAPTER IV.

The Extent to which Malaria Prevailed.

It is unfortunately impossible to assert positively that malaria was unknown in Greece during the early period. The argument from silence is proverbially dangerous, but it is at least remarkable that the ancients themselves threw doubt upon the meaning of the Homeric reference to πυρετός, while some of the best scholars hold that the word ἠπίαλος, as used by Theognis, means nightmare and not ague. On the other hand, excellent authorities have been at a loss to reconcile with the presence of severe endemic malaria the high state of civilisation which is known to have existed. On the whole, it is safe to assert that the disease could not have been prevalent to any great extent.

With regard to Attica the evidence appears to be a little more conclusive. In the first place, there is the curious prominence of fever, with special mention of ἠπίαλοι, in the *Wasps* of Aristophanes. Secondly, the introduction of the cult of Asclepius (420 B.C.) implies that ill health was common. Finally, the Decelean War, by preventing the cultivation of the soil, offered most favourable conditions to the malaria mosquito.[1] It is quite certain that this war would greatly increase the amount of malaria in the district, if it existed at all before; if, on the other hand, the disease was absent from Attica before the last quarter of the fifth century, it would, on its introduction, spread with great rapidity

[1] See Cardamatis in Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 118, Εἶνε δὲ γνωστόν, ὅτι ὅπου μετὰ καταστροφὰς πόλεων πολυανθρώπων ἕνεκα πολέμων καὶ δηώσεων ἐγκατελείφθησαν αἱ πεδιάδες καὶ αἱ κοιλάδες ἀκαλλιέργητοι, ἐκεῖ ἡ ἑλονοσία ἀνεπτύχθη εἰς μέγαν βαθμόν. The writer then quotes Laveran, *Traité du Paludisme*, p. 26.

owing to the neglect of irrigation and agriculture during the Peloponnesian War. In either case, whether Attica was or was not malarious during the period before her struggle with Sparta, the frequent mention of malaria in the plays of Aristophanes is certainly accounted for by the condition of Attica at the time.

There is no *a priori* difficulty involved in the supposition that Attica was non-malarious, or comparatively so, even as late as 430 B.C. It is now known that two factors—mosquitoes and infected persons—are necessary before the disease can spread; so that the enquirer is no longer in the difficulty of Macculloch, who seems to have been only too eager to admit that Rome in her day of greatness was not malarious, but was yet forced to take the other view, just because he was convinced that where marshes are, there malaria must abound. But if Anopheline mosquitoes were few in number, and the malaria patients entering the country from malarious regions escaped being bitten, the disease would not get a firm grip upon Attica until favourable conditions were offered to the mosquito.[1] Then, especially if the number of malaria patients coming in from abroad increased, as they probably would do in war time, a malaria epidemic would be a certainty; and, once epidemic, the disease usually becomes endemic. Even during the last few years, according to observers on the spot, malaria seems to have increased in certain parts of Attica. The present fearful state of Marathon is said by Dr. A. K. Anastasopoulos to be due to the railway running into Boeotia. Increased facility of communication has, according to this authority, caused malaria patients from

[1] There is a historic parallel in Mauritius, into which (apparently) Anophelines were introduced in 1866. Before then a few patients from India were in the island, but autochthonous cases did not occur. In 1866 there was a bad epidemic, and malaria has raged in the island ever since. The passage in the text was written before I saw the remarkable confirmation of it in the work of Ross referred to in the Preface.

Boeotia to be bitten by the mosquitoes in the Marathonian marshes. Whether this explanation be true or false, it is at least certain that malaria has much increased in this district even within the memory of man.[1]

It seems probable enough that when once the disease established itself in ancient Greece it raged severely. Many facts at any rate point in this direction. In spite of the woods that in classical times were growing on the mountain sides,[2] torrents (*χαράδραι, χειμάρροι*) were

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 280, Ἐκτὸς τῶν εἰρημένων φρονοῦμεν ὅτι ἡ συγκοινωνία ἔχει σημασίαν διὰ τὴν διάδοσιν τῆς νόσου ταύτης ἐν τῷ δήμῳ Μαραθῶνος. Ἀφ' ὅτου δῆλα δὴ χωρία τινα τοῦ δήμου τούτου συνεδέθησαν σιδηροδρομικῶς πρὸς τὴν Βοιωτίαν, ἔνθα αἱ ἑλώδεις νόσοι εὑρίσκονται εἰς μεγάλην ἔντασιν, εἰς τὰ χωρία ταῦτα ἡ διάδοσις τῆς ἑλονοσίας ἐξήρθη. Τοῦτο δύναται νὰ ἐξηγήσῃ τις παραδεχόμενος ὅτι ἀνωφελεῖς κώνωπες μετηνέχθησαν διὰ τῶν σιδηροδρομικῶν ἁμαξῶν ἐκ τῆς Βοιωτίας ἐνταῦθα ὅπου δάκνοντες διέδιδον τὴν νόσον. Προτιμότερον ἤθελεν εἶναι νὰ παραδεχθῇ τις τὴν ἐξῆς λύσιν· πολλοὶ ἐργάται τῆς σιδηροδρομικῆς γραμμῆς διεννυκτέρευον ὁτὲ μὲν ἐν Βοιωτίᾳ ὁτὲ δ' ἐν τῷ δήμῳ μας· προσβαλλόμενοι δ' οὗτοι ἐν Βοιωτίᾳ μετέφερον τὰ πλασμώδια τοῦ Laveran ἐνταῦθα, ὅπου νύσσοντες τούτους οἱ ἀνωφελεῖς τοῦ τόπου μας, οἱ τέως παρθένοι, ἐμολύνοντο· καὶ οὗτοι διὰ νύξεως μετέδιδον τὴν νόσον εἰς τοὺς κατοίκους. Τὸν τοιοῦτον, διὰ τῆς συγκοινωνίας δῆλα δή, τρόπον τῆς διαδόσεως συμπεραίνω ἐκ τοῦ ὅτι ἀμέσως μετὰ τὴν ἔναρξιν τῆς σιδηροδρομικῆς συγκοινωνίας ἀφ' ἑνὸς μὲν ἡ ἑλονοσία εἰς τὰ εἰρημένα χωρία ἐξήρθη εἰς μέγαν βαθμόν, ἀφ' ἑτέρου δὲ παρετηρήθησαν μορφαὶ ἑλωδῶν πυρετῶν, ἄλλοτε ἄγνωστοι, ὡς συνεχεῖς, κακοήθεις, παγετώδεις καὶ αἱμορραγικαὶ μορφαί. It would be most interesting if similar information could be gathered from other quarters. There may be, for instance, districts into which not malaria, but some one parasite of it (say the malignant tertian), has been introduced quite recently. The opposite of this is now going on in Greece, where the quartan seems to be vanishing, perhaps because quinine is rapidly killing the parasites. In classical times quartans were very common; now they are rare. See e.g., Stéphanos, *op. cit.*, p. 497.

[2] Stéphanos, *op. cit.*, p. 398, "Plusieurs montagnes dans la Grèce ancienne n'étaient assurément pas boisées; cependant bon nombre de forêts, conservées depuis l' antiquité, ont été détruites pendant le moyen âge ou livrées au feu plus récemment surtout par des bergers valaques." Cf. *ibid.*, p. 493, "Dans l'ancienne Grèce, l'existence d'un grand nombre de forêts sur les montagnes, qui empêchaient les courants hivernaux de descendre dans les plaines et vers la mer très gonflés et très-impétueux, etc."

common enough, and these, by partially drying up in summer, would form little pools and so spread malaria, as they do to this day.[1] The Greeks had a special name (*τέλμα*) for land which, being low, became a marsh after heavy rain.[2] Swamps of this sort breed mosquitoes very rapidly, and the references show how common they were. Ischomachus, in explaining to Socrates a good way to enrich the land says:—"Heaven supplies water, all the low places become swamps (*τέλματα*) and the earth supplies all kinds of growth. He who is going to sow must clear the land. If he throw into the water the refuse, the mere lapse of time will turn it presently into that in which the land delights. For what growth, what earth does not, when in stagnant water, become manure?"[3] This single passage is enough to show that ancient Greece fulfilled the conditions required for the rapid development of malaria, although the method recommended in the *Oeconomicus* would, no doubt, lessen the danger to a certain extent. Strabo's description of Boeotia[4] forces the reader to conclude that malaria would

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 9, Ὡς ἐκ τῆς ἀποψιλώσεως δὲ ταύτης τῶν ὀρέων ἐγεννήθη πλῆθος χειμάρρων, οἵτινες μετὰ πᾶσαν ῥαγδαίαν βροχὴν τὰς πεδιάδας πλημμυρίζοντες μετέβαλον τὴν Ἑλλάδα εἰς ἄθροισμα ἑλῶν καὶ κατέστησαν αὐτὴν ἑστίαν βαρείας ἑλονοσίας.

[2] Cf. Herodotus, ii., 93, ἐπεὰν δὲ πληθύεσθαι ἄρχεται ὁ Νεῖλος, τά τε κοῖλα τῆς γῆς καὶ τὰ τέλματα τὰ παρὰ τὸν ποταμὸν πρῶτα ἄρχεται πίπλασθαι. Aristophanes, *Birds*, 1593, ὄμβριον ὕδωρ ἂν εἶχετ' ἐν τοῖς τέλμασιν.

[3] Xenophon, *Oeconomicus*, xx., 11, ὕδωρ μὲν ὁ ἄνω θεὸς παρέχει, τὰ δὲ κοῖλα πάντα τέλματα γίγνεται, ἡ γῆ δὲ ὕλην παντοίαν παρέχει· καθαίρειν δὲ δεῖ τὴν γῆν τὸν μέλλοντα σπείρειν· ἃ δ' ἐκποδὼν ἀναιρεῖται, ταῦτα εἴ τις ἐμβάλλοι εἰς τὸ ὕδωρ, ὁ χρόνος ἤδη αὐτὸς ἂν ποιοίη οἷς ἡ γῆ ἥδεται. ποία μὲν γὰρ ὕλη, ποία δὲ γῆ ἐν ὕδατι στασίμῳ οὐ κόπρος γίγνεται;

[4] Strabo, book ix., ch. 2. Strabo rarely refers to malaria, even when he is describing places which we know were unhealthy. This must mean that malaria was so common that its presence was nothing remarkable. What Strabo does think strange is the freedom from malaria enjoyed by a few places, such as Alexandria, whose situation appeared favourable to the disease.

spread there with great rapidity and to a high degree of severity, and an examination of the context where Greek writers use the words ἕλος,[1] τῖφος[2] and their derivatives affords additional proof of the extent to which the country could harbour the mosquito.

The immediate neighbourhood of Athens was probably more marshy in ancient times than it is now. Besides the bed of the Ilissus, which then, as now, was often a series of shallow pools, there were swamps in the neighbourhood of the Piraeus and Phalerum, and small marshes near the Lyceum, the Ceramicus, in the district called Limnae and on the site of the Stadium.[3] The Cephisus, in all probability, bred hosts of mosquitoes at the proper season, and it is just possible that the sacred olives (*μορίαι, σηκοί*) which were preserved so carefully, even when they had become old and rotten, helped to increase the number of the insects.[4] Athens itself was very muddy in wet weather, as is clear from a passage in the *Wasps*, where the old men who form the chorus are represented as much troubled by the mud in the streets.[5]

[1] Strabo, viii., ch. 3, § 10 (346), *πρὸς γὰρ δὴ τῷ ἄντρῳ τῶν Ἀνιγριάδων νυμφῶν ἐστὶ πηγή, ὑφ' ἧς ἕλειον καὶ τιφῶδες τὸ ὑποπίπτον γίνεται χωρίον· ὑποδέχεται δὲ τὸ πλεῖστον τοῦ ὕδατος ὁ Ἄνιγρος, βαθὺς καὶ ὕπτιος ὤν, ὥστε λιμνάζειν.* Apollonius Rhodius, iv., 976, *ἀμ πεδίον καὶ ἕλος λειμώνιον.* Pausanias, viii., 36, 6 (temple near Megalopolis of Demeter *ἐν ἕλει*). *Iliad*, iv. 483; xv. 631; xx. 221. *Odyssey*, xiv. 474.

[2] Apollonius Rhodius, i. 127, *Ἐρυμάνθιον ἄμ μέγα τῖφος.* Theocritus, xxv. 15, *Μηνίου ἄμ μέγα τῖφος.*

[3] See, for the ancient topography of Attica in relation to malaria, Cardamatis in *Ἡ ἑλονοσία ἐν Ἑλλάδι*, pp. 114-116. The writer refers to Strabo, p. 397; Plato, *Lysis*; Scholiast on Aristophanes, *Plutus*, 431; Pausanias, I., xiv., 5; Strabo, i., 3, p. 59; Plutarch, *Cimon*, 13. Porphyry tells us that the Academy was unhealthy (*De abs.*, i. 36).

[4] See the *Lancet* for October 19th, 1907, where a writer says that in India decayed stumps of trees containing water often harbour mosquito larvae.

[5] See especially ll. 256, 257—

κἄπειτ' ἴσως ἐν τῷ σκότῳ τουτονὶ στερηθεὶς
τὸν πηλὸν ὥσπερ ἀτταγᾶς τυρβάσεις βαδίζων.

Of course it is not likely that larvae of Anophelines would have been found in the streets of Athens, but the muddy state of these streets shows that suitable puddles must have existed in suitable places.

Aristotle says in his *Natural History* that larvae were often to be found in muddy cisterns (*φρέατα*) and other places where there was a sediment of earth. This in all probability refers to *Chironomus,* but the Athenian method of storing water may well have helped to spread malaria. I cannot identify with Anophelines any of the insects mentioned in Greek writings, but the Athenians were sadly plagued by mosquitoes and other insects.[1]

But the most cogent testimony to the rapidity with which malaria must have spread is to be found in the absence of prophylactic measures and the lack of adequate means of treatment. While the Greeks knew that marshes were dangerous, they do not appear to have been in the least aware of the part played by the mosquito. Herodotus mentions, apparently as a curiosity, the habit of the Egyptian marsh-dwellers, who at night wrapped themselves in their fishing-nets in order to avoid the bite of the insect; while the word for mosquito-net (*κωνωπεῖον, κωνωπεών*) seems to be of quite late origin. Some of the Greek customs were calculated not a little to increase disease. The Greeks carried on their wars in the warm months.[2] The Olympic games were held in the middle

[1] Aristophanes, *Plutus,* 537—

φθειρῶν τ' ἀριθμὸν καὶ κωνώπων καὶ ψυλλῶν οὐδὲ λέγω σοι
ὑπὸ τοῦ πλήθους, αἳ βομβοῦσαι περὶ τὴν κεφαλὴν ἀνιῶσιν.

Compare with this *Clouds,* 157, and *Birds,* 245.

[2] The danger of warfare carried on in the summer is well illustrated by the story in Polyaenus (*Strategica,* ii. 30, 3). Clearchus the tyrant, wishing to kill many of his citizens, led out a levy as though to besiege a town *ἐν τοῖς κυνικοῖς καύμασιν.* These he made encamp *ἐν ἑλώδει χωρίῳ καὶ νηνέμῳ καὶ μεστῷ στασίμων ὑδάτων,* while he with his mercenaries took up a position on high ground. It is no wonder that the citizens were struck down by an epidemic (*διέφθειρεν ὥρᾳ θέρους τὸ ἑλῶδες καὶ ἐπίνοσον τοῦ στρατοπέδου*). Many Greek armies must have suffered severely from malaria, and it is perhaps just because this was so common that we hear so little about it.

of summer, that is, in the height of the malaria season, and also in a district liable, because of the river Alpheius, to become malarious. The enormous crowds that gathered together on such occasions from all quarters of the Greek world could scarcely fail to become badly infected.

It is quite impossible adequately to fight malaria without quinine. In Italy its sale is regulated by law, and the Greek Anti-malaria League is striving hard to secure for Greece a constant supply of the drug, and to see that it be cheap and pure. Stéphanos says that the Greek peasant values quinine as highly as he does bread.[1] Physicians have noticed that since the use of quinine has become more common, malaria has diminished, not only in extent but in severity. In ancient Greece, of course, quinine was unknown, and the disease must have run its course unchecked by any really efficacious remedy. It should be observed that quinine not only relieves the patient, but also, by killing the parasites in his blood, prevents the mosquito from carrying the infection from him to healthy persons.

[1] *Op. c.*, p. 502. "Il faut y ajouter le rejet de plusieurs moyens thérapeutiques nullement efficaces ou même nuisibles, comme l'étaient les saignées et les purgatifs drastiques, tandis que d'autre part le paysan grec estime maintenant la quinine à l'égal du pain."

CHAPTER V.

The Effects of Malaria.

History contains many instances, far too numerous to discuss here, of disasters in war caused by malarial disease.[1] In this respect there is but little difference between the effects of malaria and those of enteric, typhus, plague and smallpox, all of which have again and again proved far more deadly than the weapons of human foes. The peculiar and distinctive characteristics of malaria are not to be looked for in these sudden and violent catastrophes. Owing to the manner in which it is propagated, it tends to fasten itself upon certain districts,[2] and once there, generally speaking, it remains for ever. Of course there are exceptions; ague gradually disappeared from England as the marshy parts were drained, and the application of the results of scientific research has diminished considerably the amount and severity of the disease in Italy and elsewhere.

This being so, malarious regions gradually lose many of their inhabitants, not only by death but also by emigration.[3] Examples are Sologne in France, the Campagna and many parts of India. Those who leave the country to seek healthier homes are mostly the rich and the intelligent; and so at length there remains but a residue of the poor, the stupid, and the unenterprising.

[1] The Walcheren expedition will come to the mind of every reader. There is a good instance in Greek history recorded by Polyaenus (*Strat.*, ii. 30, 3).

[2] "Endemic foci," as they are called by physicians.

[3] See Celli, *Malaria* (Eng. tr.), pp. 18, 19, "The regions where this pestilence is most prevalent are those which contribute most largely to permanent emigration."

Left to themselves, these wretched inhabitants sink into still greater degradation, for they are without any to ameliorate their lot by example, precept or active help. "The moral sense of the natives of these towns," says North,[1] "is so degraded, that the death of a horse or mule is said to be a matter of far greater concern to them than that of a child or relative." Williams[2] quotes the experience of Bishop Heber, who "says the whole skirt or margin of the mountains [the Himalayas from the Rohilcund country] is surrounded by a thick forest, of nearly two days' journey, with a marshy soil and an atmosphere, during two-thirds of the year, 'more pestilential than the Sunderbunds or the Grotto del Cane.' . . . . . The villages, also, through which he passed, he says, were singularly wretched, though there is no want of building materials, and the rate of land is very low. It seems, however, as if the annual ague took away all energy from the inhabitants, who are a very ugly and miserable race of human beings, with large heads and particularly prominent ears, flat noses, tumid bellies, slender limbs, and sallow complexions." The inhabitants of the Roman Campagna are scarcely less wretched.[3]

This emigration from unhealthy to healthy districts

[1] *Roman Fever*, p. 103. Cf. J. R. Martin, *The Influence of tropical Climates on European Constitutions*, p. 138, "A slothful, squalid-looking population invariably characterizes an unhealthy country."

[2] *Elements of Medicine*, vol. ii., pp. 420-421. Professor Nieuwenhuis, of Leyden, informs me that he has seen, among the tribes of Borneo, exactly those disintegrating effects of malaria which I hold are visible in the history of the Greeks. See his book *Quer durch Borneo.*

[3] See the graphic description in Celli, *op. cit.*, pp. 170-182, and *La Malaria en Italie*, by E. Bertaux, in *Revue des Deux Mondes* for August 15th, 1900, especially p. 860, "Si pourtant l'on compare les statistiques régionales de la malaria et de l'émigration, on trouvera des coïncidences assez frappantes pour laisser croire que le premier de ces deux faits n'a pas été sans action sur l'autre."

certainly occurred in ancient Greece, although it must be admitted that there is little positive evidence to be brought forward. The *Cyropaedia* proves that the salubrity or the insalubrity of sites was a constant theme for discussion,[1] and such debates must have had more than a theoretic interest. Some of the emigrants of the third century B.C. found their way to Alexandria. Although it was doubtless the disturbed state of the country and the decline of agriculture that led many Greeks to leave their homes, yet it is surely more than a mere coincidence that Strabo notices, with surprise, the healthiness of Alexandria, in spite of its apparently dangerous situation.[2]

The degradation of those who inhabit malarious places was carefully recorded by Hippocrates.[3] He states that those who live in low, moist, hot districts, and drink the stagnant water, of necessity suffer from enlarged spleen. They are stunted and ill-shaped, fleshy and dark, bilious rather than phlegmatic. Their nature is to be cowardly and averse from hardship; but good discipline can improve their character in this respect. This remarkable account is, so far as I know, unique in Greek literature, but it is a certain proof that the Greeks were well aware of the deleterious effects of malaria.

So apathetic do those become who reside in unhealthy

[1] Xenophon, *Inst. Cyri.*, i. 6, 16.

[2] Strabo, v., pp. 213, 214.

[3] For instance, *περὶ ἀέρων κ.τ.λ.*, Kühn, i., pp. 566, 567 (Kühlewein, i., pp. 68, 69), *ὁκόσοι δὲ κοῖλα χωρία καὶ λειμακώδεα καὶ πνιγηρὰ καὶ τῶν θερμῶν πνευμάτων πλέον μέρος μετέχουσιν ἢ τῶν ψυχρῶν ὕδασί τε χρέονται θερμοῖσιν, οὗτοι δὲ μεγάλοι μὲν οὐκ ἂν εἴησαν οὐδὲ κανονίαι, ἐς εὖρος δὲ πεφυκότες καὶ σαρκώδεες καὶ μελανότριχες, καὶ αὐτοὶ μέλανες μᾶλλον ἢ λευκότεροι, φλεγματίαι δὲ ἧσσον ἢ χολώδεες· τὸ δὲ ἀνδρεῖον καὶ τὸ ταλαίπωρον ἐν τῇ ψυχῇ φύσει μὲν οὐκ ἂν ὁμοίως ἐνείη, νόμος δὲ προσγενόμενος ἀπεργάζοιτ' ἄν.* The last clause certainly seems to imply that Hippocrates had seen malarious districts, the inhabitants of which had not lost their good qualities. Possibly Sparta is referred to; *νόμος* certainly had enormous influence there.

regions, that it is often observed how careless of their own improvement they seem to be. "It is a characteristic moral feature," says Macculloch,[1], "of those who reside in such unhealthy situations in France, and a fact noticed by every one who has examined those districts, to deny strenuously the existence of danger; and to maintain that neither the soil which they inhabit, nor the air in which they die rather than live, nor their modes of life or labour, are unwholesome." I have found no expression of this apathy among the ancient Greeks, but it may be that references to the serious consequences of malaria would be more numerous if the very presence of the disease had not blinded the eyes of those who lived under its influence.

Malarious regions are generally extremely fertile. The moisture which favours the growth of the mosquito at the same time renders the soil suitable for agriculture. The increase of malaria is an economic calamity which robs a country of its most precious source of wealth.[2] So tempting is the chance to become rich that many come from more healthy quarters, and, with their lives in their hands, endeavour to reclaim the land which has been abandoned by their predecessors. This is true of modern Greece,[3] and two hundred years ago it was true

[1] *Malaria*, p. 9.

[2] Stéphanos, *La Grèce*, pp. 442, 443, "Ainsi, d' une part, dans les districts les plus fertiles de la Grèce, de grandes étendues du sol se trouvaient sous l' influence de la malaria, cause de misère physiologique, d' une natalité relativement faible et de mort prématurée pour une grande partie de leur population." The writer is referring to the period which followed the War of Independence.

[3] Stéphanos, *op. cit.*, p. 493, "Mais, avec le retour surtout de la liberté, on a commencé, dans la plupart des pays grecs, à descendre vers les plaines et les rivages; en même temps, par suite du développement de la culture de plusieurs territoires marécageux, une grande portion de la population s'est trouvée exposée à l' influence de la malaria." Cf. also p. 540, where the writer says that the healthy highlanders come down to the plains to better their position, and quickly become anaemic.

also of England. Defoe,[1] when passing through Essex in 1722, observed that "not one-half of the inhabitants are natives of the place; but such as from other countries or other parts of this country settle here for the advantage of good farms; for which I appeal to any impartial inquiry, having myself examined into it critically in several places."

But in spite of these often repeated attempts, rarely permanently successful without the help of modern science, to work profitably on malarious sites, the economic loss is enormous. Celli[2] sums up briefly and to the point; "Malaria annually costs Italy incalculable treasure." So great are the damage and the moral degeneration caused by the disease that many have been at a loss to account for the splendour and full development of the ancient civilisations. Special attention has been paid to the state of Italy during the flourishing period in the history of Rome. Macculloch,[3] after a very fair enquiry, can come to no definite conclusion. He is content with pointing out how "puzzling" a problem it is, although the only reason why he refuses to believe that ancient Italy was less malarious than it is now is his conviction that where marshes are, there there must be malaria—a generalisation which is now known to be too sweeping. Brocchi[4] held that the ancient Romans were as subject to unhealthy influences as are the modern inhabitants of Italy, but were saved from the worst effects by the use of their thick, woollen toga. As wool gave way to linen and silk, so did the fever increase. North boldly declares that "it is inconceivable that a civilised and powerful people, such as the ancient Etruscans undoubtedly were, should have established themselves and built great cities

[1] *Tour through the Eastern Counties of England.*

[2] Celli, *op. cit.*, p. 19.

[3] *Op. cit.*, pp. 162-174.

[4] *Dello Stato fisico del Suolo di Roma*, pp. 69-81; Macculloch, *Malaria*, pp. 301-303.

in a country so fever-stricken as the northern parts of the province of Rome and the Tuscan Maremma now are." And again he writes: "What we do know is, that their prosperity and civilisation were quite incompatible with the presence among them, in any grave form, of such an enemy to progress and prosperity as malaria." [1] The inference drawn by North is that malaria increased as prosperity declined, being the result, and not the cause, of the decay of civilisation. [2]

[1] North, *op. cit.*, p. 67. It is very remarkable that Pausanias attributes the power of the Achaean League, among other things, to the comparative freedom from disease enjoyed by its members: Ἑλλήνων δὲ οὐ ταισομένων τηνικαῦτα ἔτι ἐν κοινῷ, ... οἱ Ἀχαιοὶ μάλιστα ἴσχυον· τυράννων τε γὰρ πλὴν Πελλήνης αἱ ἄλλαι πόλεις τὸν χρόνον ἅπαντα ἀπείρως ἐσχήκεσαν αἵ τε ἐκ πολέμων καὶ ἀπὸ τῆς νόσου συμφοραὶ τῆς λοιμώδους οὐκ ἐς τοσοῦτο Ἀχαιοῖς ἐφ' ὅσον τοῖς ἄλλοις ἐγένοντο Ἕλλησι (vii., 7, 1). Pausanias, therefore, certainly attributed in part to disease the decline of the Greeks in the third century. λοιμώδης νόσος is an unusual phrase for malaria, but there is no reason why it should not have that meaning, especially as Pausanias, perhaps influenced by the great pestilence which broke out in the reign of Marcus Aurelius, uses it some eighteen times, and applies it (apparently) to any epidemic sickness: I do not think that πυρετός occurs in Pausanias. It may be noted that late writers often confuse "plague" (λοιμός) and malaria. Thus, as we have seen, Diodorus (xii. 58) attributes the Athenian Plague to exhalations from swamps. Malaria is called λοιμός in Polyaenus, *Strategica*, ii. 30, 3.

[2] Neglect of agriculture may undoubtedly tend to increase malaria, and it is of course impossible to separate definitely the influence of malaria upon decay from that of decay upon malaria. In Greece some states were probably malarious before their decline, others may have become infected after decay began. All societies seem to contain latent seeds of decay; in the case of Greece these are obvious and universally recognised. Malaria, besides causing much positive harm, gave these seeds a chance to develop fully, and made it impossible for the Greeks to check their growth. Many Greek states may be said to have been non-malarious when founded, non-malarious while growing great and prosperous, but malarious when they had reached their full growth. That malaria precipitated the decline can hardly be doubted; that it was the determining factor in most cases is scarcely less certain. The remarkable rapidity of the decline is best explained in this way. Which factor gave the initial impulse is immaterial.

The point upon which I would lay stress is the difficulty felt by acute observers of believing that malaria has not increased since the classical period. And this difficulty is not a whit the less in the case of Greece. If the Greeks of the great period were highly malarious, they were a truly marvellous people. Stéphanos believes that malaria has much increased since the Middle Ages,[1] and he is very positive as to the mischief it causes;[2] further, he refuses to admit that there were great endemic *foci* in the majority of Greek districts during classical times.[3]

As a rule, towns are less malarious than the country,[4] so that the urban population tends to absorb the agricultural class. In consequence national physique and well-being suffer. But in ancient Greece there were causes at work which, at least in part, neutralised this tendency. In the first place, several parts of the country remained comparatively healthy,[5] and migration took place to these as well as to the towns.[6] Besides this, there are strong reasons for believing that the old Greek cities were not so free from malaria as might be supposed. The modes of

[1] Stéphanos, *op. cit.*, p. 493.

[2] *Ibid.*, pp. 459, 441, 443, 465, 479, 486 ("Il ne faut pourtant chercher l' activité du Grec ni dans les contrées où la malaria, en infectant fortement l' organisme, en brise la vigueur, etc."), 491.

[3] *Ibid.*, 493.

[4] Savvas in 'Η ἑλονοσία ἐν 'Ελλάδι, p. 13, *τὰς πόλεις, ἐν αἷς ἡ νόσος αὕτη εἶνε σχετικῶς σπανιωτέρα ἢ ἐν τοῖς χωρίοις.*

[5] See especially Libanius, *σύγκρισις ἀγροῦ καὶ πόλεως*, Reiske, iv., p. 1007, *ἐν ἀέρι πολὺ βελτίονι τοὺς ἐπὶ τῶν ἀγρῶν διαιτᾶσθαι.*

[6] There was also migration from town to town. See Mahaffy, *Greek Life and Thought*, p. 314. "Nevertheless it would be distinctly false to say that city life, as a whole, was decaying in the golden age of Hellenism. The very reverse is the case. But with a few exceptions the centre of gravity shifted in each district from the old to the new foundations, and men were prouder or better off as citizens of an Arsinoe or Lysimacheia or Casandreia or Berenike than of Thespiae or Pagasae or Halicarnassus." This shifting was certainly due in great part to the development of new trade-routes; but the latter were not altogether independent of malaria, because the disease throws districts out of cultivation.

storing water, and the muddy state of the roads[1] in wet weather, show that conditions in towns were not unfavourable to the growth of the malaria mosquito.[2] A parallel is to be seen in ancient Rome, which in the imperial times was so unhealthy that all who could afford it migrated in summer to their country villas.[3] Even if the Greeks did migrate more and more into their towns [4] as malaria increased, it would be impossible to say how far this was due to other causes, such as the civil wars which distressed the country right up to the period of Roman suzerainty. Personally, I am of opinion that the influence of malaria was strong, but it cannot, I think, be proved.

One of the most serious consequences of malaria is its effect upon the young. In the worst districts every child is affected, and partial immunity, which is the most that can be hoped for, does not come before the age of puberty. The untrained eye frequently fails to diagnose the disease, owing to the less marked form it assumes in a young patient, and to this perhaps is due the comparative silence of the ancient authors on this important question. Malaria often causes convulsions, when it occurs in children, and from the many references to this symptom as characteristic of infantile disease [5] it is plain,

[1] See *Janus* for December, 1907. The new cities founded on the model of Alexandria may have been more healthy. See Mahaffy, *Greek Life and Thought*, p. 327.

[2] See Aristophanes, *Wasps*, 256, 257, and *Plutus*, 537, 538.

[3] Jones, Ross, and Ellett, *Malaria*, pp. 69-73, Macculloch, *op. cit.*, p. 173.

[4] Mahaffy, *op. cit.*, pp. 328-330, points out how in the third century B.C. there was "a sudden increase of city life all over the world . . . . the myriad population changed from country life, or the life of villages, into that of towns." Mahaffy seeks for causes in the comfort of the towns, as compared with a farmer's life, and in the systematization of trade. Malaria may have been another cause. It is important to notice that *new* towns were built, one at least of which (Alexandria) was non-malarious.

[5] Cf. Cardamatis in Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 112.

although it might well have been assumed, that the sufferings of the little ones of Greece helped to swell the amount of pain and misery that malaria inflicted. Modern Greece offers an instructive parallel. Major Ross examined the children of Moulki, a small village on the Copaic Plain, and his account explains how malaria affects the well-being of a nation by making unhealthy the lives of the young. "The scene," he says, "was most interesting. Seated under a large tree, with the village priest as our patron and protector, we pricked and palpated the little ones, one by one. I never saw pluckier children. Scarcely one of them even winced at the vivisection. Nearly all of them were very intelligent, and many good-looking; but, alas! most of them were far from well, and some looked miserably ill, emaciated and anaemic. The cause was speedily revealed. Out of 62 of the children, between the ages of 5 months and 14 years, no less than 35 were found to have enlarged spleens. . . . Hence, out of a total 62 children, no less than 40 were certainly infected—a ratio of them of 64·5 per cent." [1] It is easy to see how a child, whose early years are marked by a succession of weakening attacks of fever, will probably enter adult life with a debilitated constitution and an ill-educated mind. Ancient literature, however, has not preserved much definite information about the physical condition of the young. The clearest light is thrown upon the question by the declaration of the Roman poet Martial; "In summer boys learn enough if they keep well." [2]

It has been pointed out that the Greeks were quite conscious how great is the danger from chill and over-exertion in a malarious country. Aristotle [3] states bluntly

[1] Ross, *Malaria in Greece* (*Journal of Tropical Medicine*, Nov. 15, 1906). Compare with this Savvas in Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 10, κατ' ἐξοχὴν προσβάλλεται ὑπὸ τῆς νόσου ἡ παιδικὴ ἡλικία.

[2] Martial, x. 62.

[3] *Parva naturalia*, 462b.

that fatigue is the cause of fever, while the Plutarchian treatise on the preservation of health is one continued protest against exhausting the body by excess or chill.[1] The dwellers in malarious regions, consciously or unconsciously recognising the peril, tend to avoid toil, either of body or of mind, if it be so violent that an attack of fever may be expected to follow. In time the impulse becomes stereotyped as a habit, and so, partly for the reason given here and partly because the energetic emigrate to healthier homes, laziness and lack of enterprise are marked characteristics of these unfortunate people. Each generation as it is born is subjected, not only to the same physical surroundings as were its parents, but also to an unhealthy moral atmosphere. The evil results of such a condition have often been observed by physicians and others. "The natives of India," says Martin,[2] "of the higher classes, avoid all exertion during the rainy season; while the working classes, at all seasons, are sparing of extra labour, and when compatible with the work in hand, sitting is ever the posture of the artizan in the East." "There is in hot climates, it has been well observed, a vis inertiae which indisposes men to change their customs, or to cope with abuses; and the indolence which the climate occasions conduces to the stability of their barbarous institutions."[3] Englishmen have noticed the evil mental conditions which they have themselves experienced as the result of tropical fevers. Beete Jukes, who took part in the surveying voyage of H.M.S. *Fly*, traces to these diseases the "inertness, indolence and indifference to anything beyond the comfort of the passing hour—

[1] So great is the danger lest chill should precipitate an attack, that some have thought that malaria is nothing but chill. Such is the view of Dr. Oldham. See his book *What is Malaria?*, London and Calcutta, 1871. The theory of North is but an amplification of this.

[2] *Op. cit.*, p. 453.

[3] *Ibid.*, p. 35.

the want of energy and action so almost universally characteristic of the resident in hot climates."[1] Very similar is the opinion of Ramsay,[2] who appeals " to all who have experience, whether this is not a singularly apt description of that fever, which has such an annoying and tormenting habit of catching one by the heel just at the most inconvenient moments, in the midst of some great effort, and on the eve of some serious crisis, when all one's energies are specially needed." Stéphanos [3] admits that, although the modern Greeks are one of the most hard-working races of South Europe, it is hopeless to expect to find activity in the malarious districts.[4] The quotation given above from the *Airs, Waters and Places* of Hippocrates shows that the ancient Greeks also perceived the want of energy which characterizes those who live in unhealthy regions.

The malign consequences of malaria include, as Hippocrates says, not only laziness but cowardice. The coward is proverbially cruel, and so the history of a malarious country will probably be marked by fitful efforts, begun under the influence of excitement, pursued with no constancy or vigour, and often stained by perfidy, deceit, blind folly and savage cruelty. But other causes may bring about these moral faults, and though the Alexandrian period of Greek history illustrates the bad

[1] See *Quarterly Review* for 1869, No. 127, p. 80. I owe this reference to Dr. W. H. D. Rouse.

[2] *The Church in the Roman Empire*, p. 64. Ramsay holds that St. Paul was a victim of malaria, and that the disease is referred to as the "thorn in the flesh."

[3] *Op. cit.*, p. 486.

[4] He adds the very interesting and important statement that the keen desire for gain sometimes triumphs over the most enervating environment. "On trouve une grande activité dans les districts salubres et dans ceux, plus ou moins fertiles, où l' exportation est grande, comme, par exemple, dans les parties où l' on cultive le raisin de Corinthe. Là le cultivateur non seulement se borne à un repos de peu de durée, mais aussi il travaille souvent souffrant et même en proie à un accès fébrile."

qualities developed by malaria, and that to a quite remarkable extent, it is, perhaps, unsafe to assert confidently that malaria was the primary cause. Nevertheless the evidence of Polybius, throwing light, as it does, upon the character of the Greeks during the century that preceded the Roman conquest, deserves careful consideration. He is a sharp critic of the Greek statesmen, pointing to their selfishness and lack of good faith.[1] Brutality is said to have been particularly rife among the people of Cynaetha, and Polybius traces it to neglect of music and to climatic influences, although disease is not specially mentioned, so that it is perhaps a mere coincidence that the modern Calavryta [2] and its neighbourhood are very malarious.[3] The Boeotians underwent a complete change of character after Leuctra. They lost ambition, and cared for nothing but pleasure, becoming effeminate in soul as well as in body.[4] Here again it may be nothing more than an accident that Boeotia is, and perhaps always has been, one of the most malarious districts in the country.[5] The Greeks in general displayed want of good faith and want of courage;[6] madness and ferocity were infecting everybody;[7] the whole country seemed to be under an evil spell [8]—such is Polybius' account of the condition of affairs just before the final triumph of Rome, and he states that the worst points in the Greek character were love of pleasure and aversion from toil.[9] Even

[1] Polybius, vi. 56.

[2] The ancient Cynaetha.

[3] Ἡ ἐλονοσία ἐν Ἑλλάδι, p. 19, ἐν τῇ ἐπαρχίᾳ Καλαβρύτων προσεβλήθησαν πλέον τοῦ ἡμίσεος τῶν κατοίκων. Οὕτως ἐν τοῖς δήμοις Καλαβρύτων καὶ Καλλιφωνίας ἐνόσησαν 50%, Ἀροανείας 75%, Κερπινῆς 25%, Κλειτορίας 70%, Λαπαθῶν 10%, Λευκασίου 50-70%, Παἰων 20-90%, Σουδενῶν 40% καὶ Ψωφίδος 75%.

[4] Polybius, xx. 4. Mahaffy, however, says that the account is incredible.

[5] Ἡ ἐλονοσία ἐν Ἑλλάδι, p. 17.

[6] Polybius, xxxviii. 5.

[7] xxxix. 11. [8] xxxix. 9. [9] xxxix. 12.

Mahaffy, although by no means apt to give Polybius more credit for historical accuracy than he deserves, agrees with the general picture that is drawn of the decay of Greek morality, and adds cruelty to the list of vices with which the decadent Greeks may justly be charged.[1]

The evidence of Polybius bears very closely upon another point, the rapid depopulation of Greece during the second century B.C. This may have been due partly to the emigration from the country, which was continually going on; while in its turn the emigration may have been caused by malaria; farming being dangerous, men's activities were directed towards commerce, which was greatly encouraged by the opening up of the East. But did malaria kill many people? In all probability it did, but not to such an extent as greatly to reduce the population. Polybius [2] expressly states that serious pestilences did not occur at the time of which he is speaking, and lays the blame of depopulation upon the selfishness of the Greeks, who, being addicted to pleasure, either did not marry at all or refused to rear more than one or two children, lest it should be impossible to bring them up in extravagant luxury. The next sentence of the writer warns us that we must not take the remark about the absence of disease in the strictest sense, for he goes on to say that when there are but one or two sons the death of one by war or pestilence is a serious matter. In fact, deaths from malaria might be neglected in a full

[1] Holm, although a strong champion of the Greek character, weakens in his defence when he comes to the period of the Roman conquest. "Hertzberg (i. 97) tries to prove that the Greece of that age was no longer 'morally sound,' and adduces much damaging evidence. Yet patriotism and love of liberty had not died out, and that after all was something noble. Hertzberg holds that Macedonian rule had at that time ceased to be a foreign rule for the Greeks" (*History of Greece*, iv., p. 353). It will, I think, be admitted that the view of Droysen, Mommsen, and Christ, who believe that signs of moral decay are plain even in the New Comedy, receives strong confirmation when account is taken of the prevalence of malaria, a disease with such a powerful tendency to bring moral decline.

[2] xxxvii. 9.

population, but when the rising generation is limited, malaria or any other disease becomes a most dangerous menace. In modern Greece deaths from malaria are comparatively few, being about 1 in every 176 cases,[1] but two considerations have to be remembered before making any calculations as to the number of deaths caused by malaria in ancient Greece. Modern methods of treatment have greatly reduced the severity of the attack and the chances of a fatal issue.[2] In Greece many victims had recourse, not to medicine, but to some form of magic or priestcraft, and even the physicians were without the great specific for malaria—quinine. In the second place, although malaria may not be the direct cause of many deaths, indirectly it is more serious.[3] It may safely be concluded that malaria killed many people, but the number would not have been enough permanently to reduce the population had not other factors been in active operation. Be this as it may, it cannot be doubted that malaria greatly diminished the average length of human life.[4] The writer of the pseudo-Aristotelian *Problems* expressly states that those who live in low, marshy districts age rapidly.[5]

When to the above have been added the loss of time

[1] Ἡ ἑλονοσία ἐν Ἑλλάδι, p. 13.

[2] Williams, *Elements of Medicine*, vol. ii., p. 489, "The modern mode of treatment, however, has so greatly diminished the severity of the paroxysm, that these symptoms [coma, delirium] are rarely observed." Williams's book appeared so long ago as 1841.

[3] Oldham, *What is Malaria?* p. 3, "It is to be borne in mind, in considering the mortality resulting from malarious disease, that the deaths reported as occurring from fevers bear but a small proportion to those resulting from secondary affections, induced by repeated attacks of these complaints. The number of constitutions irretrievably injured by the same cause can of course never be known."

[4] Celli, *Malaria*, p. 18, "The average life of the worker in malarious places is shorter, and the infant mortality higher, than in healthy places."

[5] [Aristotle], *Problemata*, xiv. 7, διὰ τί οἱ μὲν ἐν τοῖς εὐπνόοις τόποις βραδέως γηράσκουσιν · οἱ δὲ ἐν κοίλοις καὶ ἑλώδεσι, ταχέως;

and waste of energy, in the case of both patient and nurse, which are caused by endemic malaria, the physical and material damage has been, perhaps, fully described. There yet remains the problem, obscure but intensely interesting, of the direct influence of malaria upon character. That disease and climate affect the moral life was noticed by Montesquieu.[1] Cabanis,[2] who made a careful study of the relations existing between the physical and moral sides of human life, discusses in particular the consequences of consumption and the intermittent fevers. It is in patients suffering from these diseases that the moral change is easiest to perceive. The general question of the effect of illness upon character was a familiar one in the time of Herodotus,[3] and Theophrastus[4] seems to have paid it special attention. But it is in Plato that the most pertinent evidence can be found. He declares that the humours of acid and salt phlegms, and such as are bitter and bilious, when no outlet for them from the body can be found, befog the soul and produce manifold vices—peevishness, melancholy, rashness, cowardice, forgetfulness and stupidity.[5] Plato evidently has in mind some

[1] *L' Esprit des Lois,* liv. xiv. ch. 2, 5, 10, 11, 14.

[2] *Rapports du Physique et du Moral de l' Homme,* vol. i., pp. 440 foll.

[3] He hints that the physical infirmity of Cambyses made him also mentally diseased (iii. 33).

[4] See Plutarch, *Pericles,* 38. Of course the problem was sure to suggest itself quite early. Delirium would be regarded as an obvious instance. Cf. the use of *νοσῶ, νόσος,* etc., to denote mental or moral states.

[5] Plato, *Timaeus,* 86e, *ὅπου γὰρ ἂν οἱ τῶν ὀξέων καὶ τῶν ἁλυκῶν φλεγμάτων καὶ ὅσοι πικροὶ καὶ χολώδεις χυμοὶ κατὰ τὸ σῶμα πλανηθέντες ἔξω μὲν μὴ λάβωσιν ἀναπνοήν, ἐντὸς δὲ εἰλλόμενοι τὴν ἀφ' αὑτῶν ἀτμίδα τῇ τῆς ψυχῆς φορᾷ ξυμμίξαντες ἀνακερασθῶσι, παντοδαπὰ νοσήματα ψυχῆς ἐμποιοῦσι, μᾶλλον καὶ ἧττον, καὶ ἐλάττω καὶ πλείω· πρός τε τοὺς τρεῖς τόπους ἐνεχθέντα τῆς ψυχῆς, πρὸς ὃν ἂν ἕκαστ' αὐτῶν προσπίπτῃ, ποικίλλει μὲν εἴδη δυσκολίας καὶ δυσθυμίας παντοδαπά, ποικίλλει δὲ θρασύτητός τε καὶ δειλίας, ἔτι δὲ λήθης ἅμα καὶ δυσμαθίας.* It is worthy of notice that the Academy was notoriously unhealthy. Porphyry, *De abs.,* i. 36.

cachexia rather than an acute disease; and as he must have known malarial cachexia well, it is probably[1] the diseased state referred to by him. Accordingly, besides Hippocrates, Plato may perhaps be taken as witness to the evil effects of malaria upon character.

Before proceeding it will be well briefly to consider what the Greeks meant by "melancholy." The question is extremely complicated, not only because the ancient classification of diseases by symptoms gives rise to perplexing ambiguities, but also because of the connexion of the term with the doctrine of the "humours." Galen [2] defines melancholy as an affection, without fever, that injures the mind and is accompanied by profound depression and aversion from the things the patient loves best. In some cases excess of black bile injures the stomach, so that vomiting occurs and consequent harm is done to the mind. The treatise *On Melancholy*, printed by Kühn in the nineteenth volume of his edition of Galen, contains a fairly complete account of the disease. The hypochondria are often affected first; indigestion, vomiting and foul breath are noticeable symptoms; while sleeplessness, fear and depression are some of the mental derangements of the patient. The greatest diversity is to be found. Some fear death, others commit suicide; some shun the light, others darkness. The disease may be either constitutional or acquired by an unhealthy mode of living. Galen also states that it commonly occurred in adults, rather than in the young.[3] In the Hippocratic *Corpus* the disease is mentioned several times, and in particular it is brought into

[1] Of course certainty on such a point is impossible. But Plato's description does suggest malarial cachexia.

[2] Kühn, xix., p. 416, *μελαγχολία ἐστὶ πάθος βλάπτον τὴν γνώμην μετὰ δυσθυμίας ἰσχυρᾶς καὶ ἀποστροφῆς τῶν φιλτάτων γιγνόμενον ἄνευ πυρετοῦ· τισὶ δὲ αὐτῶν καὶ χολὴ προσγινομένη πολλὴ μέλαινα βλάπτει στόμαχον, ὥστε καὶ ἀπεμεῖσθαι καὶ οὕτως τὴν γνώμην συγκακοῦσθαι.*

[3] Galen, Kühn. xvii.b, p. 644.

connexion with symptoms of apoplexy and delirium. At the end of the sixth book of the *Epidemics* [1] an intimate relation is pointed out between "melancholy" and epilepsy.

Enough has been said to show that the disease may generally be identified with melancholia, the causes of which are sometimes mental and sometimes physical, such as a debilitating illness or declining strength.[2] All the symptoms mentioned above, the depression, derangements of the digestive organs, delusions, lack of sleep, offensive breath, can be seen in the case of modern patients; and besides the milder form, there is also acute melancholia, when the patients, instead of being depressed, are panic-stricken, and in violent frenzy behave like madmen, tearing off their clothes and trying to escape from those about them.

But there are other points to be considered. Hippocrates [3] in a famous passage of the *Aphorisms* says that melancholia (as it may now be called) was most common in spring and in autumn, that is, at the beginning and at the height of the malarial season. Again, melancholia is evidently the disease caused by "black bile," [4] to which the Greek doctors attributed quartan fevers.[5] In the popular speech the words *μελαγχολία*, *μελαγχολῶ*, *μελαγχολικός* denote that a man is crazy or neurotic, [6] and occur for the first time very soon after the terms

[1] Hippocrates, Kühn, iii., p. 630, *οἱ μελαγχολικοὶ καὶ ἐπιληπτικοὶ εἰώθασι γίνεσθαι ὡς ἐπὶ τὸ πολύ, καὶ οἱ ἐπίληπτοι μελαγχολικοί.*

[2] See the article by Dr. G. F. Blandford in Quain's *Dictionary of Medicine.*

[3] Kühn, iii., p. 724. Apparently autumn was the period when most melancholia prevailed. See e.g. [Hipp.] Kühn, iii., p. 585, and Galen, xvii.b, p. 644.

[4] *ἡ μέλαινα χολή.*

[5] See e.g. the treatise *On the Nature of Man* (*sub. fin.*), Kühn [Hippocrates], i., p. 370, when it is said that *οἱ τεταρταῖοι πυρετοὶ μετέχουσι τοῦ μελαγχολικοῦ.*

[6] See Burnet on Aristotle, *Eth.*, 1150b.

πυρετός, πυρέσσω become common.[1] Finally, Galen holds that large spleens (a sure sign of continued malaria) are caused by excess of the "melancholy humour."[2]

Three facts need to be taken into account in drawing a conclusion :—

(1) Melancholia is very often the result of physical debility.

(2) There is a marked tendency of malaria to cause anaemia.

(3) There is a connexion, in the Greek medical writers, between melancholia on the one hand, and autumn, big spleens and the supposed origin of quartans [3] on the other.

Sometimes, doubtless, "melancholy" [4] was not our melancholia; many causes, likewise, must have brought about true melancholia among the Greeks. But it seems impossible to avoid the inference that malaria was the chief source of the disease. If this be so, the Greeks were acute enough to see that malaria may, directly or indirectly, produce a change of character, and this conviction found expression in the common use of μελαγχολία and its cognates to denote crazy or nervous conduct. Nor is this all. The importance attached to melancholia in the medical writers, and the fact that it gave a new word to the popular speech, prove that it

[1] μελάγχολος ("dipped in gall") is found in Sophocles, *Tr.*, 573; μελαγχολῶ is used by Aristophanes in the *Birds* (14), and in the *Plutus* (12, 366, 903). It is most interesting to note that Chrysippus, the Stoic, thought virtue might be lost through drunkenness or melancholia (Diogenes Laertius, vii. 127). Incidentally this shows how common a disorder the latter was.

[2] Kühn, xvi., p. 385, σπλῆνες μεγάλοι διὰ τὴν τοῦ μελαγχολικοῦ χυμοῦ περιουσίαν.

[3] It is very remarkable that Galen gives a quartan periodicity to "splenic diseases and to melancholia generally;" καὶ οἱ παροξυσμοὶ . . . . τοῖς δ' ἀπὸ σπληνὸς καὶ ὅλως μελαγχολικοῖς διὰ τετάρτης (Kühn, xvii.b, p. 385).

[4] Sometimes it seems to mean little more than "biliousness."

was of frequent occurrence. Cabanis [1] calls particular attention to this. A large number of the inhabitants were afflicted with this strange disorder, which is one no less destructive to the mental faculties than to the body. The exact proportion of the population affected, it is, of course, impossible to ascertain, as the ancients have left us no statistics on the point. But there can be no doubt that there were enough sufferers from melancholia and malarial debility to form a serious hindrance to healthy social life.[2] Even those who were sound must have been the worse for coming into daily contact with persons of unhealthy mind. To us, perhaps, the danger does not appear grave; but account has to be taken of the peculiar features of Greek life. The greatness of the Greek character depended in no slight degree upon the constant intercourse of a comparatively small number of men, who met to discuss and transact the business of a city-state. If but a small proportion suffered at one time from the consequences of malaria, in the course of a generation the number would be enough greatly to weaken the mental life of the whole

[1] *Rapports du Physique et du Moral de l'Homme*, vol. ii., p. 174, "En lisant avec attention les écrivains anciens de médecine, l' on voit que les maladies atrabilaires, et surtout les altérations qu'elles peuvent occasionner dans l' état des deux systèmes, lymphatique et cutané, étaient autrefois bien plus communes qu' aujourd 'hui."

[2] Dr. Cardamatis, an excellent authority, holds that psychical disturbances do not survive the malarial infection. See his careful paper in the Transactions of the Panhellenic Medical Congress, 1901, p. 21, *ἀμφισβητήσιμοι δὲ πάντως εἰσὶν αἱ ἀπαντῶσαι* (sc. *ψυχικαὶ διαταραχαί*) *μετὰ τὴν διαδρομὴν τῆς ἑλομιάνσεως καὶ δὴ αἱ εἰσμεμακρισμένας ἀπὸ ταύτης ἐποχάς*. It must be observed that the view given above is quite consistent with this. A malarious patient, on being removed to a healthier region, will recover his mental tone; but if he be constantly under the influence of the disease, or live with those who are injured by it, he must suffer more or less in character. Habits are acquired which, in time, become independent of the physical states that first caused them to be formed. Dr. Cardamatis ignores the question of habits altogether.

community. The mischievous effect upon the children can scarcely be exaggerated. Those whose parents were victims could rarely fail to copy the characteristics of their elders, to form habits of indecision, and to sink into pessimism, moroseness, ferocity and other forms of psychic weakness.

It is surely not fanciful to trace to this source the subtle but unmistakable change which came over the Greek character after the fifth, and to a greater degree after the fourth century before Christ. Gradually the Greeks lost their brilliance, which had been as the bright freshness of healthy youth. This is painfully obvious in their literature, if not in other forms of art. Their initiative vanished; they ceased to create and began to comment. Patriotism, with rare exceptions, became an empty name, for few had the high spirit and energy to translate into action man's duty to the state. Vacillation, indecision, fitful outbursts of unhealthy activity followed by cowardly depression, selfish cruelty and criminal weakness are characteristic of the public life of Greece from the struggle with Macedonia to the final conquest by the arms of Rome.' No one can fail to be struck by the marked difference between the period from Marathon to the Peloponnesian War and the period from Alexander to Mummius.[1] Philosophy also suffered, and became deeply pessimistic even in the hands of its best and noblest exponents. " Absence of feeling," " absence of care,"—such were the highest goals of human endeavour.

How far this change was due to other causes is a complicated question. The population may have suffered from foreign admixture during the troubled times that followed the death of Alexander. There are, however, many reasons against the view that these disturbances

[1] I am aware that much of this change is apparent only, being due to the immense inferiority of the historians of the later period. If there had arisen in the third century a genius like Thucydides, our views on the subject would probably have been different.

produced any appreciable difference of race.[1] The presence of vast numbers of slaves, not members of households, but the gangs of toilers whom the increase of commerce brought into the country, pandered to a foolish pride that looked upon many kinds of honourable labour as being shameful and unbecoming to a free man. The very institution that made Greek civilisation possible encouraged idleness, luxury and still worse vices.[2] Unnatural vice, which in some states seems to have been positively encouraged, was prevalent among the Greeks to an almost incredible extent. It is hard not to believe that much physical harm was caused thereby; of the loss to moral strength and vigour there is no need to speak. The city-state again, however favourable to the development of public spirit and a sense of responsibility, was doomed to fail in a struggle against the stronger powers of Macedon and Rome.[3] The growth of the scientific spirit destroyed the old religion. The more intellectual tried to find principles of conduct in philosophy; the ignorant or half-educated, deprived of the strong moral support that always comes from sharing the convictions of those abler and wiser than oneself, fell back upon degrading superstitions. In either case there was a serious loss of that spirit of self-sacrifice and devotion which a vigorous religious faith alone can bestow. Without such a spirit, as history proves conclusively, no

[1] See Stéphanos, *op. cit.*, pp. 421, 422. I have myself compared the measurements of the heads of Greek statues to see whether the cranial index varied from epoch to epoch. The figures obtained certainly showed a change, but the obvious difficulties of measurement, and the possibility that the standard of taste may not have coincided with the physiological facts, prevent any inference being drawn. The few Greek skulls which have been found do not furnish any more reliable *data*.

[2] For slavery in Greece see Schmidt, *Ethik der alten Griechen*, ii., pp. 203-209.

[3] The lack of national unity among the Greeks, and the deficiencies of the city-state, are well brought out by Colin, *Rome et la Grèce*, pp. 275-280.

nation or people can survive. Finally, the commercial position of the country declined with the development of direct communication between East and West. "Alexandria and Rhodes soon occupied the position once held by Corinth and Athens." [1]

With all these forces in operation it may be said that there is no need to drag in malaria in order to explain the decline of the Greek nation. This criticism, specious as it may appear, is in reality unsound. Surely it is pertinent to reply that a vigorous people will bravely cast aside worn-out institutions and adopt others; will not yield to vicious habits, but overcome them; will not calmly look on while others succeed to their place, but make a desperate effort to assert themselves. The presence of an endemic disease, weakening each generation as it was born, and unchecked by prophylaxis or antidote, gave free scope for action to other disintegrating forces and made recovery impossible. Colin,[2] in his masterly description of the decay of Greece, brings out very well the fact that even in the great period it is possible to discern traces of those flaws which afterwards proved the ruin of the race. At no time were the evils of faction and of want of unity unfelt; barbarity can be seen in the history of tyranny and in the Peloponnesian War as well as in the pages of Polybius; want of good faith has its prototype in Odysseus "of many wiles;" that the Athenians were lovers of words rather than deeds struck Cleon [3] no less perhaps than the Romans. It is, I think, reasonable to see in malaria one factor, out of

[1] See Finlay, *Greece under the Romans*, chap. i. In this chapter Finlay brings out well the influence upon the Greeks of the deviation of trade-routes.

[2] *Op. cit.*, pp. 269-310 and 323-330.

[3] Thucydides, iii. 38, *εἰώθατε θεαταὶ μὲν τῶν λόγων γίγνεσθαι, ἀκροαταὶ δὲ τῶν ἔργων κ.τ.λ.*, and Livy, viii. 22, Graecis, gente lingua magis strenua quam factis. Colin, *op. cit.*, p. 303.

probably many others,[1] that caused these harmful tendencies to develop to such a dangerous extent.

Athens shared in the decline as much as any other Greek state. The depth to which her people had sunk is illustrated by the famous ode of Duris addressed to Demetrius.[2] The Epicurean philosophy is typical of the general state of morals prevalent during the third century. If the more refined became Epicureans, the common people degenerated into mere pleasure-seekers, ready to submit to any external tyranny provided that their ease and comfort remained unimpaired.[3] If the New Comedy can be trusted to give a faithful copy of contemporary life, the Athenians had grown frivolous, luxurious and strangely wanting in moral principle.

This disastrous change is all the more striking because of the lofty position previously held by Athens. No other state had displayed the characteristic Greek virtues to such a high degree. So marked a change implies a special cause, and this is probably to be found in the Peloponnesian War. For a generation the Athenians were engaged in war with their fellow Greeks; Attica was continually laid waste, and after the Lacedaemonians established themselves at Decelea, cultivation of the soil

[1] The later Greeks seem to be a race prematurely old. There can be no doubt that the amazing growth of civilisation in all departments, so characteristic of the period of enlightenment, taxed overmuch the physical strength of the people.

[2] Athenaeus, vi. 253—

ὦ τοῦ κρατίστου παῖ Ποσειδῶνος θεοῦ,
χαῖρε, κἀφροδίτης.
ἄλλοι μὲν ἢ μακρὰν γὰρ ἀπέχονται θεοί,
ἢ οὐκ ἔχουσιν ὦτα,
ἢ οὐκ εἰσίν, ἢ οὐ προσέχουσιν ἡμῖν οὐδὲ ἕν.
σὲ δὲ παρόνθ' ὁρῶμεν,
οὐ ξύλινον οὐδὲ λίθινον, ἀλλ' ἀληθινόν.

See also Colin, *op. cit.*, p. 284.

[3] Polybius, v. 106, ἀκολουθοῦντες δὲ τῇ τῶν προεστώτων αἱρέσει καὶ ταῖς τούτων ὁρμαῖς, εἰς πάντας τοὺς βασιλεῖς ἐξεκέχυντο καὶ μάλιστα τούτων εἰς Πτολεμαῖον, καὶ πᾶν γένος ὑπέμενον ψηφισμάτων καὶ κηρυγμάτων, βραχύν τινα λόγον ποιούμενοι τοῦ καθήκοντος διὰ τὴν τῶν προεστώτων ἀκρισίαν.

of necessity came practically to a standstill. The pick of the young manhood fell in battle; the failure of one enterprise only, the Sicilian expedition, must have reduced seriously the population of a city that guarded its citizenship so strictly, that losses could be made good only by its own productiveness.[1] During the whole war Athens lived in a state of alarm and excitement that could not fail to exercise an evil influence on the rising generation, even before it was born. Soon after the war began came the Plague, at a time when practically the whole population of Attica was penned up in Athens, the Piraeus and the space between the Long Walls. Whatever its nature, it was a fatal disease, and spared not even the strongest. Indeed there is some reason for believing that virulent infections attack by preference the soundest constitutions.[2] In addition to this, we have evidence, to my mind overwhelming, that malaria, although possibly present before, became endemic in Attica at a time when neglect of cultivation and drainage offered favourable conditions for the growth of the mosquito. Such a conjunction of misfortunes must have proved peculiarly disastrous to a people who refused to recuperate lost strength by admitting immigrants as citizens. Athens received a shock from which recovery, in the circumstances, was impossible.

Whatever view be taken of the Athenians of the fourth century B.C., whether it be Droysen or Holm that comes

[1] This strict limitation of citizenship, common to all the states of Greece, must have helped to foster decay. These states were so small that they soon needed the new blood which was rigorously excluded by law. In some countries it is possible to abandon malarious sites and to build up prosperous communities in the healthy parts; Greece is small, and nearly every valley can breed the mosquito. It is for this reason that the evil consequences of malaria are to be seen so plainly in the history of the country.

[2] See a note by T. Spencer Jerome in my article, *Malaria and History*, in the *Annals of Tropical Medicine and Parasitology*, vol. i., No. 4, February, 1908, p. 540.

nearer to the truth, no one will doubt that under the Roman dominion the general character of the Greek race was no longer what it had been in the glorious days of the past. It would be a simple task to show how the imperfections of the later Greeks, the decline in physical excellence,[1] the lack of mental and moral strength, even the depopulation of the country, can be accounted for by the wide prevalence of malaria. But such a line of reasoning would be fallacious in the extreme. Malaria, no doubt, was operating through the whole period and producing its inevitable consequences. In particular, by exacting a heavy penalty from those who subjected themselves to strain or fatigue, it created habits of laziness and indifference. But malaria was not the only factor in the change. It was but one out of many causes, a single component of a most complex whole. What the other components were I have tried to indicate briefly in the preceding pages.

Malaria, then, is a disease which attaches itself to particular districts, and its consequences may be classified as follows :—

(1) The rich, the capable and the energetic seek healthier homes, and so the inhabitants of a malarious district tend to become a mere residue of the poor and wretched.

(2) Cities being, as a rule, less malarious than cultivated plains, the urban population tends to absorb the agricultural class, and national physique and well-being suffer in consequence. Cities isolated by malarious surroundings often fall into decay and ruin.

(3) This process will be accompanied by great economic loss, for extremely fertile districts, which are the peculiar prey of malaria, may fall altogether out of cultivation. The ruin of agriculture is a great blow to any country,

[1] See e.g. Dion Chrysostom., *Orat.*, xxi. (*ad init.*), αἱ δὲ τῶν ὕστερον εἰκόνες ἀεὶ χείρους καὶ ἀγεννεστέρων φαίνονται, τὸ μέν τι ὑπὸ τῶν δημιουργῶν, τὸ δὲ πλέον καὶ αὐτοὶ τοιοῦτοί εἰσιν.

and it must be remembered that malaria attacks farmers in particular, and that mostly at harvest-time, when all their energies are specially needed.

(4) Malaria falls most heavily upon the young, whose physical powers are so weakened by repeated attacks of fever that childhood may be one long sickness, and adequate education impossible. *Aestate pueri si valent satis discunt.* The inhabitants of malarious districts age rapidly and die young.

(5) Exertion and strain often bring about a relapse, because the malaria parasite will live in the body for months, or even years. Naturally, the inhabitants of malarious places tend to avoid fatigue, and to become sluggish and unenterprising. A habit of laziness is gradually formed.

(6) Account must also be taken of the loss of life, loss of time and the physical suffering caused by the disease, besides the permanent psychical disturbances it may produce in the patient.

Appeal made to the Greek Government by the Greek Anti-malaria League, Athens, 1907.

" From the severity and extent of malaria throughout all the country one can easily perceive the moral and material losses this fearful disease inflicts upon it.

" In the first place, it attacks especially the age of childhood, and kills a large number of children, who, besides being weak because of the cachectic condition of their parents, are very apt in consequence to die from the attacks, not only of malaria itself, but also of the other diseases that accompany it; and so our otherwise excessive infant mortality is greatly increased. Moreover, even those who escape an early death and reach manhood are so imbued with the poison that they suffer from extreme debility precisely at the time when they ought to find themselves at the very height of their productive capacity. And since this disease is generally long, extending over a considerable period and attacking with repeated paroxysms, it produces chronic cachexia, and undermines health from the beginning to the end of life, bringing premature old age and untimely death. As, owing to the lasting influence of the malarial poison, the sufferers are incapacitated from all work, on the one hand, they are subjected to the great expenses that this disease involves, and, on the other, it is with much difficulty that they provide the means to live. It ought to be considered an aggravation of the disease that country people are particularly liable to it, precisely those, in fact, from the hands of whom the kingdom expects the most valuable contributions, and who not only need bodily strength to accomplish their heavy and laborious toil, but are deprived of the means of a safe and

speedy recovery. Finally, it is of great significance that this disease rages just at the time when the farmer needs all his powers to gather in the fruits of the earth that are the reward of his long and continual toil.

" The damage, then, inflicted by malaria is manifold. While it increases the death-rate and checks the growth of population, it also ruins the quality of the present as well as of the coming generation, lessens the resisting power of individuals and their capacity for work, and so contributes very largely to the increase of poverty and its attendant evils. Tens of millions must be the amount that is wasted yearly in the expense of nursing, through the idleness of the sick, the imperfect work of the cachectic, and the uncultivated land; the Italians rightly look upon their losses as exceeding the interest on the national debt.

" Accordingly throughout Greece the prevalence of malaria is the most serious of social questions; in comparison with it the others should be considered as of secondary importance, while it deserves the earnest attention of the Government and Council. A million acres remain uncultivated, three hundred thousand people fall sick every year, and in consequence are compelled more or less to curtail their work, and two thousand die. What other social question is there the seriousness of which can be compared with the gravity of these figures?

" Therefore the problem of existence is, throughout Greece, the problem of malaria, because it constitutes one of the most important causes of our economic misfortunes, engendering poverty, stimulating emigration, ruining the quality of the race and so involving the greatest diminution of the national and military strength of the kingdom.

" No one could have pictured the damage done by this disease more graphically than the memorable Aphentoulis, who in the same Medical Congress of 1887 spoke as follows:—' Malaria is the ubiquitous foe of the Greek

people, continually sapping their strength, and often, as a messenger of Death, swooping down and laying waste the land in the form of pandemic disease, involving physical exhaustion of every kind, besides loss of life. Last summer, autumn and even winter the disease assumed serious proportions everywhere among us, and you, sirs, who are delegates gathered together from the ends of the land, bring, each one of you, manifold deep impressions from the dreadful sickness. . . . Malaria is the sword of Damocles hanging above our heads. It chokes the rising generation, drains the strength of the adults, lays waste our fields and weakens the arms of our warriors. Numbers of soldiers have fallen victims to fevers. I wish to say besides that these same malarial fevers are crushing the nation, body and soul, and fostering among us idleness and all the evils that spring from idleness. Breathing their poisonous breath upon the face of the Greek land they shorten by one-half the life of the nation, and, like Harpies, defile all that they cannot devour or snatch away.' "

Ἔκκλησις πρὸς τὴν Κυβέρνησιν καὶ τὴν Βουλὴν περὶ ἐξυγιάσεως τῆς χώρας ἀπὸ τῶν ἑλειογενῶν πυρετῶν.—§ 3.

The following extracts from Macculloch's *Malaria* (1827) are given to show how serious were the consequences of malaria before scientific treatment and prophylaxis came into vogue:—

(Macculloch, *Malaria,* Ch. xi, pp. 428—438.)

"Had I been writing to the people of France or Italy, I might have omitted a large portion of this chapter, since it could only serve to remind such persons of what is far better known to them than it can be to me; but while I am sure that such a state of things is scarcely suspected by the people of England, however much, as travellers, many of them must be interested in the facts, I have also reason to believe that it is much less known to the medical profession in our own country than it ought to be. For the authorities, I might refer to a host

of authors, Italian and French; but I need not here repeat names, of which the most important are quoted in this book for various purposes; while the facts have been confirmed to me, partly by living witnesses in whom I can place the greatest confidence, and partly by my own personal observations. They who may have travelled with an observant eye, in France, Italy, Holland, Sicily, Greece, or America, will have little difficulty in recognizing the transcript of an original which must often have attracted their attention.

"It must not be understood that every one of the circumstances, physical and moral, here noticed, occur in every pernicious district; since their number and intensity are proportioned to the quantity or the virulence of the Malaria, and to other collateral causes which it must be now unnecessary to enumerate; but France and Italy can produce examples, as can also many other countries, where the facts are not exaggerated by the picture of them here presented. And if England is a far more moderate sufferer, it still possesses tracts, and includes people, among which many of the lighter evils here enumerated will be found to exist. Further than this, I need not explain what, without some such explanation, might almost be deemed a caricature, or at least a picture overcharged by the imagination: while the chapter on the geography of Malaria will sufficiently indicate the places where the extremes of its pernicious effects will be found.

"That the residence of successive generations in a district of this nature produces a degeneracy of the races, is amply shown in various parts of France and Italy; and never more distinctly than when the inhabitants of the marshy plains and vallies come into immediate contact with a people of the same radical origin and race, inhabiting the healthy, mountainous or hilly tracts which bound or include these. The stature not only becomes reduced, but deformities are frequent; while,

anatomically, the bones are found to be affected; their extremities in particular being unusually large and spongy, and rickets, as a positive disease, being also an implicated consequence.

"The colour of the skin, and the general superficial aspect of the people in these cases, has never failed to attract the attention of even the most cursory travellers. The former is sallow, or yellow, or else stained with different hues, and, in extreme cases, has even a livid appearance: while, to a medical examination, it is found to pit on pressure; this condition often amounting to absolute œdema, and the muscles being soft, yielding, and unelastic. Such persons have often the appearance of being fat; but this, when it exists, is wanting in firmness, as if a great part of the accumulation consisted of water in the cellular membrane. That varices and herniæ should be common in the same circumstances are facts which belong rather to the absolute diseases that prevail in the marshy districts. It is also remarked that the hair is flaccid and the beard scanty; while, in the most poisonous regions of France, it is further asserted that pale hair abounds, when, in more healthy places, the very same race is noted for the darker tints. A dull, languid eye, very often also yellow, is a circumstance which has attracted general attention.

"An enlargement of the abdomen, commencing sometimes even from the birth, and often rendered the more conspicuous from the slenderness and emaciation of the limbs, is also a feature which no traveller has overlooked; and it is often in itself sufficient to demonstrate the nature of the place where these wretched beings are doomed to live, or rather, as the inhabitants of the Pontine marshes express it, to die. That the very form and extent of the liver can often be traced externally, by the eye, is an anatomical fact belonging to this state of things; while an investigation after death, discovers various diseased structures in that organ, in the spleen, and in the

mesenteric glands; together with water in the cellular membrane, and a general enlargement of the whole lymphatic system. In the Pontine marshes, the residents have the appearance of walking spectres; being often also œdematous all over, and thus dragging on a miserable existence through the short term of their wretched lives. That the inhabitants of such districts have a late puberty and are less prolific than in healthier regions, is a fact which has been asserted and again contradicted: yet it is one which could not excite surprise should it be proved.

"There is nothing in these pernicious countries more striking to a cursory traveller, than the appearance of age which occurs at a very early period of life. Even the children are frequently wrinkled; and, in France, in perhaps all the worst districts, a young woman, almost even before twenty, has the aspect of fifty; while, in men, the age of forty is equivalent to sixty in healthier countries, both in appearance and vigour; the very few who live to fifty, appearing to have arrived at the protracted term of four-score. Of personal beauty in females, there appears to be little trace at any time; but whatever may have existed is rarely prolonged beyond seventeen. And the expression keeps pace with all else; being that of unhappiness, stupidity, and apathy: an habitual melancholy which nothing can rouse, and an insensibility to almost everything which operates on the feelings of mankind in general. A slow and languid speech, a similar languor in the walk and in all the actions indicate equally the condition of the mind and of the body in these wretched countries.

"That the period between thirty-five and fifty is the most hazardous and diseased portion of this diseased and miserable life, is a very general remark in all the regions subject to Malaria; while it is not less generally observed that those who survive this period, often live to become old; frequently also recovering a certain portion of the

health which might have been lost. Of another general effect which has been asserted to exist, it seems reasonable to entertain some doubts; since it is an assured fact, that a high degree of nervous irritability, both mental and bodily, is a frequent attendant upon the chronic condition of the fevers of Malaria. The assertion is, that the people in question are, generally, little irritable, or even sensible; and sometimes, to such a degree, as scarcely to express the feelings of pain, even under surgical operations.

"The condition of the mental faculties, whether intellectual or moral, is scarcely less remarkable, while it is more interesting; and if there should appear any exaggeration as to some particulars, or should any special fact, as asserted, depend on collateral causes of another nature, the general bearing of the whole as related of Italy and France, has been confirmed too often by remarks of a similar nature, made in America and elsewhere by very competent observers, to leave any doubt as to the leading circumstances.

"That apathy which was just noticed as expressed in the physiognomy, is a character which influences the whole conduct of these degraded and unfortunate beings; often proceeding to such a degree that they are scarcely elevated above the beasts in point of feeling. Seeking solitude, shunning society and amusements alike, without affections, without interest in any thing, they make no exertions to better their condition; not even to avoid the sources of danger which surround them, or to take the most common precautions that are pointed out: while, attached to the soil, from habit or indolence rather than from regard, they will not be convinced of its nature or dangers; fatalists in practice and even in belief, and refusing to admit that there is any other lot in life than that which is their own.

"That the general intellectual faculties are degraded, is an universal remark; while, in many places, and very

notedly in the Maremma of Tuscany, it is observed that absolute idiotism is common. That such a condition is a frequent result of marsh fevers, and very particularly under improper treatment, is a fact which I must notice in the medical part of this work: but even independently of this, such debility of the intellect seems to be the produce of the insensible action of this poison on the nervous system: a circumstance that indeed might naturally be expected from physiological considerations connected with the general influence which Malaria exerts on the body. And that this condition is even propagated, seems, further, fully proved; so that an universal degeneracy of mind and body both, appears to be the certain lot of those races which a combination of unfortunate circumstances have placed in countries that seem to have been intended rather for the habitations of reptiles and insects than for those of man.

"Considering that various glandular affections are the produce of Malaria, it seems an object deserving of further inquiry, whether that hitherto mysterious disease also, the Cretinage of the Valais, may not possess some connection with the existence of this poison; since assuredly no explanation has yet been offered respecting it. I cannot indeed find among the authors whom I have consulted, any facts to confirm an opinion which is only offered as a hint for inquiry; and considering that analogous effects, as well as many other diseases unattended by absolute marsh fever, are produced by the gradual action of Malaria, it is at least a subject deserving the attention of those who may have an opportunity of investigating it, whether for confirmation or contradiction. It is not impossible that those writers who have attributed the disease of the Valais to the peculiarity of its atmosphere rather than to the other causes so often discussed, may have taken analogous views to this: though it must still be obvious that the attachment of the Goitre at least, to mountainous or hilly regions, all over the world, is a difficulty from which we cannot easily extricate ourselves.

"Be the explanation of this latter disease however what it may, it is an observation as old as physic itself, that inferiority of the intellectual faculties is the inheritance of those who reside in marshy countries, and in a dense, foggy atmosphere. If Hippocrates attributes to the effect of a salutary air, the very powers of the intellect themselves, the well known proverb respecting Bœotian abilities was not probably without a foundation: while, without apparently borrowing from Greece, a similar opinion has not been less extensively entertained in our own days, and, I need scarcely say, applied to Holland.

"With respect to the moral condition of the people in those unhealthy districts, the picture drawn by Monfalcon, is frightful; but as I cannot support it by sufficient evidence from other quarters, it must rest on his credibility; while it must also be questioned how far moral and political circumstances unconnected with disease or its cause, may be additional agents in the production of these effects. Not to dwell on this disgusting picture, I must content myself with naming abortion, infanticide, universal libertinism, drunkenness, want of religion, gross superstitions, as the leading features; besides which, it is further said, and even proved by the police reports, that while murders are common, a large proportion of the cases are those of premeditated and cautious assassination, by poison or otherwise: all the vices, says my authority, being of a mean and not of a bold character. But, while averse to quotation, I am also desirous to refer to a work from which I have been enabled to confirm many of the conclusions which had long presented themselves to myself, and whence I have recently derived a support which I had not found in the Italian writers on this subject; a statement of facts, as well as of opinions or conclusions, which satisfies me that I had not misled myself in those which were, not merely formed, but committed to paper and made ready for publication, long

before his book came into my hands. Coincident opinions, thus independently formed, carry with them a weight which cannot fail to strike those who have attended to the nature of evidence.

"Of the specific and definite diseases which are the produce of Malaria, or which are endemic in marshy districts, some are now notorious to the whole world, a few appear to me to deserve or require the place which they have not yet received, as its frequent if not exclusive produce, and a few others must rest on the assertions or testimony of the authors by whom they have been thus enumerated."

(Macculloch, *Malaria*, pp. 5—10.)

"But if we will not be yet persuaded to look about us at home, let us look abroad, and not even to the tropical regions, but to France, and Spain, and Holland, and Greece, and Italy, and then ask ourselves whether the subject before us is not a subject of interest. The value of life, of survivorship, the average chance of approaching to the proverbial limit of threescore and ten, is the measure of the salubrity of a country, and that salubrity depends mainly on the presence or absence, the range or the limitation, of Malaria. We may take the average of life among ourselves, in round numbers, at fifty, with sufficient safety for this purpose. In Holland it is twenty-five; the half of human life is cut off at one blow, and the executioner is Malaria; for there is no other cause for the superior mortality of that country. But there are districts in France where it is but twenty-two, twenty, eighteen; so little is the chance of life; while all the instruments by which Death executes his office, are here superseded by one, by that one which renders all others unnecessary, which has monopolized the functions of the whole dark catalogue—Malaria. Let us turn to Italy: the fairest portions of this fair land are a prey to this invisible enemy, its fragrant breezes are poison, the dews of its

summer evenings are death. The banks of its refreshing streams, its rich and flowery meadows, the borders of its glassy lakes, the luxuriant plains of its overflowing agriculture, the valley where its aromatic shrubs regale the eye and perfume the air, these are the chosen seats of this plague, the throne of Malaria. Death here walks hand in hand with the sources of life, sparing none: the labourer reaps his harvest but to die, or he wanders amid the luxuriance of vegetation and wealth, the ghost of man, a sufferer from his cradle to his impending grave; aged even in childhood, and laying down in misery that life which was but one disease. He is even driven from some of the richest portions of this fertile yet unhappy country; and the traveller contemplates at a distance deserts, but deserts of vegetable wealth, which man dares not approach,—or he dies.

"Nor do even his houses and towns afford him a shelter against this all-pervading pestilence. It enters with him into his chambers, and stalks through his streets. Imperial Rome herself is its chosen victim: man flies before it, but the enemy is behind him and around him on all sides: every day sees the dominions of death extended, and the hour is impending when the Eternal City will cease to be, when it shall submit to that fate, which has been the fate of proud Nineveh, and Babylon the queen of nations.

"Such also is Sicily, such Sardinia, and such is classic Greece. To live a living death, to be cut off from more than half of even that life, to be placed in the midst of wealth and enjoyment, yet not to enjoy, such is the fate of man in the lands of Europe where Malaria holds its chief seat; while in the tropical regions, it is to fall by thousands and tens of thousands, the summer harvest of death walking hand in hand with that of the vegetable world.

"True; from this much we are free; and we may be grateful for a security, purchased, as it is, by

an ungenial climate, and a soil less productive. But I shall soon show that our exemption is far less perfect than we flatter ourselves; that we too suffer, and that we suffer from much which we might remedy or avoid. But can we forget that we also suffer with Italy and with Greece, with Africa and the West and the East, with the entire world? As travellers, as residents, as warriors, as colonists, we partake with all; and as they suffer, so do we. Let residents, let travellers, let colonists say if it be not so. War at least cannot forget what it suffers, what it has suffered, from this cause; from that Malaria of which it is too often ignorant, which, too often it thinks fit to despise. If the sword has slain its thousands, the Malaria has slain its tens of thousands. It is disease, not the field of action, which digs the grave of armies; it is Malaria by which the burning spirit, fitted for better things, is quenched, and in the coward's bed of death. This is the Destroying Angel, the pestilence which walks at noon day; and to which all the other causes of mortality are but as feeble auxiliaries in the work of destruction. This is Malaria, the neglected subject to which I am desirous of calling attention, that by this, its powers may be diminished: Malaria, from which even ourselves, here in England, are not free, though, from ignorance, unaware of it, or, from unwillingness to receive conviction, shutting our eyes to the truth.

"What other causes may here act in producing the incredulity, let others say; yet let me make one remark at least, while the explanation I will as gladly leave to others.

"It is a characteristic moral feature of those who reside in such unhealthy situations in France, and a fact noticed by every one who has examined those districts, to deny strenuously the existence of danger; and to maintain that neither the soil which they inhabit, nor the air in which they die rather than live, nor their

modes of life or labour, are unwholesome. Always ready, and even ingenious, in excusing the place of their nativity or residence, they invent any other cause for their diseases, rather than confess or believe in the true one; and are even indignant at those who would attempt to convince them, as if that were a reproach and a calumny. This is not the feeling of Italy, it is true, more enlightened on this subject, or at least it is a rare one; but it is a very general one in Holland, as to which country it will perhaps excite a smile in particular, to know that the people of Walcheren repelled with no small indignation, at the time of the celebrated visit of our troops, the charge of unhealthiness which was brought against their beloved birth-place."

APPENDIX I.

Up to the present it has been the harm done by malaria that has claimed our attention. But in ancient Greece the disease may have helped to foster a new ideal of womanhood, which gradually became more prominent during the fourth and third centuries B.C. It is unfortunate, but inevitable, that the evidence is so slight; its true value can only be appreciated when account is taken of all the other lines of testimony that have been dealt with in the preceding pages.

It has been pointed out[1] that in the New Comedy an entirely new view of marriage and of womanhood is to be found. Whereas the older comic poets ridiculed family life and all love that was not purely sensual and bestowed upon *hetaerae* only, the New Comedy treats of love for a virgin, the consummation of which is a happy marriage. What is more, the family relations, as illustrated by these later poets, are far more pleasant than they are in earlier poetry.[2] According to the writer who first discussed this subject at length, "the idea that a woman is a worthy object for a man's love," and that such love should find its consummation in marriage, was "originally propounded by Antimachus of Colophon at the end of the fifth century," and was somehow communicated from Antimachus to Menander.[3]

Although Benecke pushes his theory to extremes, he has certainly proved that in the New Comedy the family

[1] By Mr. E. F. M. Benecke in his posthumous work, *Women in Greek Poetry*.

[2] Benecke, *op. cit.*, p. 164.

[3] *Ibid.*, p. 195.

relations are more cordial and affectionate. But it is certainly an error to regard the question from a purely literary standpoint. Literature, and the thoughts enshrined in literature, must be considered in relation to the life of the people whose manners are portrayed. If Menander shows us a more exalted view of marriage, it is not because Antimachus wrote *Lyde,* but because the Athenians had learnt to love their wives more.

For this change of feeling—for a change there was, even though we cannot accept altogether Benecke's depreciation of wedded life in early Greece—many reasons might be brought forward by the historian, the chief of which, perhaps, is the gradual decay of the city-state. As the life of the citizen grew less absorbing and less satisfying, men put a higher value upon their families and homes. But the subtle disease, the history of which has occupied the preceding pages, seems to have played a part in bringing about this result.

A most remarkable feature of the ancient medical writings is the scant attention paid to that very important factor in modern treatment—the nurse. Professional nurses were, apparently, unknown,[1] and the general impression that the reader forms is that the physician did not consider the work of the attendant to be of great value. In some cases, doubtless, the household slaves acted as nurses; thus Plutarch mentions an "old serving-dame"[2] who waited on a sick man, and Diogenes Laertius[3] makes an old woman place a charm on the neck of her patient. It is only natural that people were expected to look after their sick kindred, and so the speaker in the *Aegineticus* of Isocrates takes credit to himself for nursing a friend when the relatives of the latter were themselves incapacitated.[4]

[1] Of course midwives were common enough.

[2] *Quomodo adulator,* 63e, ἡ διακονοῦσα πρεσβῦτις. Cf. *Pericles,* 38, περίαπτον ὑπὸ τῶν γυναικῶν τραχήλῳ περιηρτημένον.

[3] D. L., iv., 56, καὶ γραῒ δῶκεν εὐμαρῶς τράχηλον εἰς ἐπῳδήν.

[4] Isocrates, *Aegineticus,* §§ 25, 28, 29.

But the burden of nursing fell chiefly upon the wife. How wide was the scope of her duties is clear from a passage of Xenophon, which to us is all the more striking because the writer does not think he is uttering anything but mere commonplace. "Whenever a slave is sick," says Ischomachus to his young wife, "you must look after him."[1] It is clear, then, that in ordinary cases it was the duty of the wife to nurse the whole household, with the help, no doubt, of her daughters or maidservants.

Now if it be true that in the fourth century there was an increase of malaria, the task of the wife must have become much heavier. In the earlier times, if the view adopted in this book be correct, the work of nursing a Greek household was comparatively light. There were children's diseases, it is true, but no measles, scarlatina, or smallpox. The adult members of the family lived healthy lives, untroubled by serious sickness except occasional epidemics of "plague," and (probably) endemic consumption. But with the increase of malaria all this would change. Few families would escape a yearly visitation, and apart from the disease itself, the wife would have to cope with the numerous maladies that are almost always its inevitable consequences. The importance and value of the wife would increase, and she would therefore be held in higher esteem and honour.

As has been shown above, an increased esteem for the wife is manifest in the New Comedy. Not only is this so, but a character in Menander, in pointing out the advantage of marriage, lays stress first and foremost upon the value of a wife as nurse.[2] The speech

[1] Xenophon, *Oecon.*, vii., 37, ὃς ἂν κάμνῃ τῶν οἰκετῶν, τούτων σοι ἐπιμελητέον πάντων ὅπως θεραπεύηται.

[2] Menander, 325 (Kock),—

ἀλλ' ἔνεστί τι
ἀγαθὸν ἀπ' αὐτῆς, παῖδες· ἐλθόντ' ἐς νόσον
τὸν ἔχοντα ταύτην ἐθεράπευσεν ἐπιμελῶς.

Against Neaera, which was written about the same time, appeals to the jury as well aware of the value of a wife in times of sickness.[1] Of course what has been said does not amount to proof, but it is at least strong confirmatory evidence of the view that malaria became a serious factor in the lives of the Greeks during the fourth century B.C.

There is but little evidence as to the manner in which the wife fulfilled this important duty of nursing her family. Evidently she had no special training, and her only skill must have been that which came from experience. Ignorant and superstitious, the women of Greece often had recourse to charms and amulets,[2] and flocked in large numbers to the dream-oracle to find out the means of curing their loved ones who were sick. But in spite of this, the Greek wife must have been trained in sympathy and tact by her work as nurse, and in this way happier relations were established between her and her husband, who possibly learnt, when prostrated year after year by a lingering disease, to appreciate those virtues which belong, in a peculiar way, to women, and especially to a mother and a wife. It will probably never be known how much the human race owes to disease for the development of the kindlier virtues of mercy, sympathy, and tenderness.

[1] [Demosthenes] *κατὰ Νεαίρας,* 1364, *ἴστε δήπου καὶ αὐτοί, ὅσου ἀξία ἐστὶ γυνὴ ἐν ταῖς νόσοις, παροῦσα κάμνοντι ἀνθρώπῳ.*

[2] See e.g. Plutarch, *Pericles,* 38, and Diog. Laert., iv. 56.

APPENDIX II.

GREECE seems to have enjoyed considerable immunity from the ordinary infectious diseases. Measles and smallpox are not mentioned: it is very doubtful whether the Hippocratic collection refers either to diphtheria or scarlatina; no case can be made out for the presence of syphilis or bubonic plague; in short, none of the more common infectious disorders of modern times, with certain important exceptions, are to be noticed in the Greek medical writings.

In the first chapter of the first book of *Epidemics* there is a very clear description of mumps, with supervening orchitis, an epidemic having occurred in Thasos. The disease does not receive any particular name, and there is no reason for supposing that it was endemic throughout Greece. Typhus almost certainly occurred, especially in the early period, as "famine-plagues" are so frequently mentioned; but as it would come in epidemics, we need not be surprised that the medical writers give no clear account of it; their attention is always taken up by endemic disease. The difficulty about typhoid has been touched upon already. The verdict of Stéphanos is, it seems to me, the right one. He says: "There is nothing definite to be said about typhoid in ancient Greece. Although in the ancient authors are to be found certain passages and clinical observations, which have been thought to point to typhoid fever, nevertheless the arguments brought forward up to the present are for the most part very inconclusive."[1] At first sight the statement of pseudo-

[1] *Op. cit.*, p. 502.

Aristotle,[1] that fevers are not infectious, seems to settle the question. On the other hand we do not know what the Greeks meant exactly by infection; when many people were attacked by a fever they probably imagined that the disease was "in the air," and not that it was carried from person to person. Again, typhoid may be included in λοιμός, which Aristotle (?) says[2] denoted a particularly infectious disease. If, however, the view be taken that typhoid did not exist, practically all the fevers in the ancient writings must be regarded as malarial; in which case the condition of Greece was much worse than it has been described in the preceding pages. Malta fever certainly existed in some parts of Greece.[3]

There can be no doubt that tuberculosis was frightfully prevalent. This is all the more remarkable inasmuch as some hold that malaria and tuberculosis are antagonistic, while the ancient Greeks certainly lived a healthy, open-air life. Not only does φθίσις hold a prominent position in the medical writers, but it was known to be contagious.[4] Lucian mentions the disease at least three times, and it appears along with fevers as a messenger and servant of death.[5]

Tuberculosis exacts a very heavy toll from modern Greece.[6] During the year 1905 there were 649 deaths

[1] *Probl.*, vii. 8.

[2] *Probl.*, i. 7.

[3] *The Lancet*, June 13th, 1908.

[4] Pseudo-Aristotle, *Probl.* vii. 8, and Isocrates, *Aegineticus* § 29, where the patient is suffering from φθόη, § 11.

[5] *Charon*, 17 [513].

[6] Stéphanos seems to under-estimate the prevalence of tuberculosis. He says: "D'après tout ce qu'on trouve dans les travaux des médecins de l' antiquité et surtout chez Hippocrate, il semble hors de doute que la tuberculose était alors une maladie fréquente dans certains pays grecs.

"Pour ce qui concerne la Grèce moderne, d' après tous les renseignements les plus anciens comme les plus récents, on peut presque affirmer que le tribut qu'elle a payé à cette maladie pendant le siècle courant n'est pas considérable. Le peu de

from it in Athens alone, and for the next two years the figures are 595 and 694; at Patras, for the same period, the deaths number 142, 117, 126, and at Syra 125, 92, 101. These give fairly high rates, and it is but natural that Professor Savvas in his inaugural address to the Greek Anti-malaria League called consumption and malaria the two diseases which, above all others, inflict the most damage upon the country. See Ἐφημερὶς τῆς Ὑγιείας, 1st July, 1905.

Diseases of the eyes were evidently extremely common. Hippocrates in his *Aphorisms* says that epidemics of ὀφθαλμίαι occurred in summer when the winter had been dry with winds from the North, and the spring had been wet with winds from the South; it was known that ὀφθαλμία was contagious.[1] This evidence is curiously confirmed by the inscriptions to votive offerings. "The favourite disease in Athens during the fourth century seems to have been bad eyes: votive eyes, in ones and twos, make up two-fifths of the whole number."[2]

densité de la population, le renouvellement incessant de l'air dans la plupart des villes et des villages de la Grèce, la vie presque continuelle de la majorité de la population en plein air, ainsi que les grandes précautions hygiéniques qu'inspire l'idée de contagion généralisée partout, expliquent en grande partie cette rareté relative. En fait, dans beaucoup de villes de la Grèce la maladie est assez commune; mais il ne faut pas oublier que la population urbaine en Grèce est minime comparativement à la population totale. Parmi les villes de la Grèce Continentale, c'est Athènes qui est la plus éprouvée par cette maladie. La tuberculose pulmonaire, dont la marche est en général rapide, y cause une mortalité de 2·9 sur 1000 habitants." *Op. cit.*, pp. 535, 536. During the last three years the mortality at Athens has been much higher than this, namely, 3·8, 3·5, and 4·2 per thousand. My calculations throughout are from the official mortality tables. It is interesting to notice that the inhabitants of modern, as of ancient, Greece are convinced that consumption is contagious. For a few coppers one can buy in Athens a popular account of the disease, of the danger of contagion, and the like.

[1] Pseudo-Arist. *Problems*, vii. 8.

[2] Rouse, *Greek Votive Offerings*, p. 212.

CONCLUSION.

In estimating the effects of malaria upon Greek history it is important to distinguish carefully that which can be proved from that which is probable or possible.

From 400 B.C. onwards malaria was endemic throughout a large part of the Greek world. Therefore, whatever be the time when it was first introduced, it must have been producing its inevitable consequences at least during the fourth century and after. These consequences include the desolation of whole districts, caused by the death or flight of the most energetic inhabitants; the harm inflicted upon children, the chief victims of malaria; the economic loss resulting from the decay of agriculture and the incapacitation of labourers and others; the development of habits of inactivity or laziness, due to the fear of a relapse, which generally follows over-exertion or chill. Hippocrates, in the treatise *Airs, Waters, Places,* tells us that the inhabitants of malarious districts are wretched physically and mentally; in the pseudo-Aristotelian *Problems* we are told that they age rapidly; while Plutarch, in the treatise *On Health,* describes how the Greeks of his day found it necessary to avoid fatigue lest an attack of fever should follow.

It is also remarkable that, according to Strabo, there was no malaria in Alexandria, the city to which the Greeks crowded in the third century.

The above conclusions may be regarded as certain.

There are only two references to malaria before 500 B.C., and both are doubtful. However, it was probably to be found in some parts earlier than this. The evil reputation of the Sybarites for effeminacy may

be due to exaggerated accounts of precautions taken by a wealthy people, and the coast of Asia Minor was probably infected at the time of the Ionic revolt. Both in Magna Graecia and in Asia Minor malaria appears, from geographical changes, to have been on the increase even in classical times.

Fever was evidently common when Aristophanes wrote the *Wasps,* and there are signs, *e.g.*, in the introduction of the worship of Asclepius into Athens, that ill health was increasing in Attica during the last quarter of the fifth century. Plutarch's account of the death of Pericles, and the statement of Diodorus that a recrudescence of the Plague was due to the action of the sun on swampy ground, seem in a confused way to imply an epidemic of malaria in Attica at this period. This probable increase of malaria coincides in point of time with certain changes in the Greek character, which ultimately proved the ruin of the race; as the disease undoubtedly has the power to disintegrate the moral fibre of a people among whom it is endemic, it is probable that the decline of the Greeks is to be attributed, at least in part, to this cause. Pausanias states that the weakness of the Greeks in the third century B.C. was partly due to disease, although malaria is not definitely mentioned. The history of the word *μελαγχολία* shows that the Greeks appreciated the evil moral effects of this disease. Malaria, in fact, is such a serious handicap to a people that, even though it does not prevent a certain degree of development, it gives free scope to other disintegrating factors. In ancient Greece malaria was all the more deadly because the small city-states were not replenished, to any extent, by fresh blood from without. As Hippocrates says that the inhabitants of malarious regions are dark-haired, it is probable that malaria tended to eliminate the fair Northern element to which the Greeks owed much of their vigour.

The history of medicine after 400 B.C. shows a growing popularity, extending even to the cultured classes, of the dream-oracle, charms and other superstitions. This has never yet been adequately explained, but an increase of malaria and its *sequelae,* which cannot be successfully treated without quinine, would account for the growth of superstitious practices and for the decline of rational methods of cure.[1]

The increased respect for women, so manifest in the New Comedy, may possibly be due to the part they played in nursing the sick. This generally fell upon the wife, and endemic malaria would vastly increase her duties and importance. Menander tells us how valuable as nurses were the Greek wives of his day.

[1] See the chapter written by Dr. E. T. Withington.

1717. LANCISI, *De noxiis paludum effluviis, eorumque remediis.*

1764. PRINGLE, *Observations on the Diseases of the Army.*

1768. LIND, *An Essay on Diseases incidental to Europeans in hot Climates.*

1815. CABANIS, *Rapports du Physique et du Moral de l'Homme.*

1820. BROCCHI, *Dello Stato fisico del Suolo di Roma.*

1827. MACCULLOCH, *Malaria.*

1829. ROUX, *Histoire médicale de l'Armée française en Morée.*

1833. FAURE, *Des Fièvres intermittentes et continues.*

1836. MAILLOT, *Traité des Fièvres ou Irritations cérébro-spinales intermittentes.*

1839. THOMANN, *Ueber die Wechselfieber in Griechenland.*

1839—1861. LITTRÉ, *Oeuvres d' Hippocrate.*

1841. WILLIAMS, *Elements of Medicine,* vol II.

1842. BOUDIN, *Traité des Fièvres intermittentes, rémittentes et continues des Pays chauds et des Contrées marécageuses.*

1856. MARTIN, *The Influence of tropical Climates on European Constitutions.*

1857. BOUDIN, *Traité de Géographie et de Statistique médicales et des Maladies endémiques.*

1870. DAREMBERG, *Histoire des Sciences médicales.*

1871. OLDHAM, *What is Malaria?*

1875. HAESER, *Lehrbuch der Geschichte der Medicin und der epidemischen Krankheiten.*

1881. HIRSCH, *Handbuch der historisch-geographischen Pathologie.*

1884. STÉPHANOS, *La Grèce au point de vue naturel, ethnologique, anthropologique, démographique et médical (Extrait du Dictionnaire encyclopédique des Sciences médicales).*

1896. NORTH, *Roman Fever.*

1898. LAVERAN, *Traité du Paludisme.*

1900. BERTAUX, *La Malaria en Italie* [*Revue des Deux Mondes,* Aug. 15].

1901. WELLMANN, *Fragmentsammlung der griechischen Aerzte.*

CELLI, *Malaria according to the new Researches,* English tr. by Eyre.

1902. CARDAMATIS, *Αἱ κατὰ τὴν ἑλομίανσιν διαταραχαί.* [See the Transactions of the Panhellenic Medical Congress in 1901.]

1906. MARY HAMILTON, *Incubation.*[1]

ROSS, *Malaria in Greece* [*Journal of Tropical Medicine,* Nov. 15].

1907. Ἡ ἑλονοσία ἐν Ἑλλάδι, publication of the Greek Anti-malaria League. Some of the most important articles are printed (in French) in the *Atti della Società per gli Studi della Malaria* for 1907.

Ἔκκλησις πρὸς τὴν Κυβέρνησιν καὶ τὴν Βουλὴν περὶ ἐξυγιάσεως τῆς χώρας ἀπὸ τῶν ἑλειογενῶν πυρετῶν.

JONES, ROSS, ELLETT, *Malaria.* Italian translation, by Dr. F. Genovese, 1908.

JONES, *Malaria in Ancient Greece and Rome* and *Disease and History* in the December number of *Janus.*

ARAVANTINOS, Ἀσκληπιὸς καὶ Ἀσκληπιεῖα.[1]

1908. JONES, *Malaria and History* in the *Annals of Tropical Medicine and Parasitology* for February.

HADJIMICHALIS and CARDAMATIS, *Report on the Work of the Greek Anti-malaria League during the Year* 1907 in the June number of the same *Annals.*

ROSS, *Report on the Prevention of Malaria in Mauritius.*

[1] The latest works on the dream-oracle.

GREEK THERAPEUTICS AND THE MALARIA THEORY.

In studying ancient therapeutic theories and practice we meet with the same evolutionary processes as occur in other departments of human thought and action.

The medical beliefs and methods of antiquity resemble those surviving among savages in the absence of differentiation and the dominance of "animism," or a tendency to substitute arbitrary personal influences for the uniformity of natural causation.

Diseases are held to be usually due to the action of demons or gods, who, if prevailed upon by prayers and offerings, or coerced by those who know the proper incantations, can also cure them.

There were of course exceptions to this theurgic or magical treatment. Surgery was in part rational from the beginning. A dislocated joint, a broken bone, or a bleeding wound show such obvious relation of cause and effect that their rational treatment is almost instinctive, though even here charms are looked upon as valuable aids, especially in the treatment of haemorrhage. Even the cure of internal disease is, in our earliest records, something more than a mere application of the resources of religion or sorcery. Disease and pain affect men so intimately, and often so terribly, that a sufferer will use any means to remove them. If he fail to persuade his god by prayer, or propitiate him by confession and sacrifice, he will resort to "sympathetic magic" or to rites and incantations which he believes have a compelling power, and *vice versa*. If both fail, he will have recourse to substances which have striking emetic or purgative action, or are in some fanciful association with

the disease, or anything which "may do good," and when some have recovered after taking these their use will become confirmed. Most frequently he will combine all these methods as in a modern "blunderbuss prescription," and we thus get that mixture of religion, magic and empiricism which marks the medical literature of the old civilisations of the Nile and Euphrates.

Recent discoveries have shown that the Egyptians were remarkably skilled in the application of splints and bandages at a period more remote from the Hippocratic age than is that time from the present.[1] But the most favourable specimen of their medical literature, the Papyrus Ebers, consists mainly of a number of prescriptions of very doubtful value interspersed with spells and incantations, and preceded by prayers to be repeated many times during their preparation and administration.[2] The remnants of medical writings found in the mounds of Mesopotamia are of a similar character, though the drugs seem less prominent and the charms and exorcisms of greater length and abundance. And there is little sign of progress or probability of escape from this system of simples and superstition. Indeed the older Egyptian records are the higher scientifically, and show a promising beginning in anatomy and surgery.

So much the more amazing is the complete contrast to all this which we find in the earliest extant Greek medical writings, the *Corpus Hippocraticum,* the great bulk of which dates from the fifth century B.C.[3] The Hippocratic writers, while treating the medical aspect of religion with the formal respect demanded by an established cult, have nothing but contempt for charms, incantations and all other such vulgarity (*βαναυσία*).[4] And, what is even more

[1] Elliot Smith, "The Most Ancient Splints," *British Medical Journal,* 1908, i., 732.

[2] *Papyrus Ebers,* translated by Joachim. Berlin, 1890.

[3] Gomperz, *Greek Thinkers,* i. 282.

[4] Kühn, i. 615.

remarkable, this rejection of the supernatural is not accompanied by increased faith in the power of drugs and specifics. On the contrary, these are relegated to a secondary position, and used sparingly in subordination to theories over-hasty and mistaken indeed, but recognising the scientific principles of uniformity and natural causation, and based upon skilled observation and definite attempts to question nature by experiment. In short, medical treatment leaps at once to a position which it failed to hold and which was not regained for twenty-two centuries.

In spite of the immortality of reputation justly bestowed upon "the great" Hippocrates, the full scientific value of the writings which have come down to us under his name has only lately been vindicated, and that mainly by the labours of a non-medical scholar, Prof. Gomperz, who, in his *Greek Thinkers*, and still more in his admirable edition of the περὶ τέχνης,[1] has shown that in these treatises we may find a main root of a product of the Greek intellect "not merely incomparable but no less than unique—positive or rational science."[2]

The neglect of the Hippocratic treatises since they were considered useless professionally, and the belief long prevalent that Greek medicine arose on a basis of priest-craft in the temples of Asclepius, helped to conceal this fact, and to hide "as in an Egyptian tomb" one of the most remarkable relics of ancient literature.

The work περὶ τέχνης is now known to be an oration by a non-professional author of great eloquence and ability, describing the nature and defending the efficacy of the healing art, and intended to be recited on appropriate occasions. In short, it is a unique and admirable sample of the "exhibitions" given by

[1] *Die Apologie der Heilkunst, eine Griechische Sophistenrede der fünften vorchristlichen Jahrhunderts.* Wien, 1890.

[2] *Greek Thinkers*, i. 275.

Sophists, and in all probability is from the hands of the first and greatest of them, Protagoras of Abdera himself.[1] And this remarkable work contains a no less remarkable account of the art of medicine as practised in Greece in the fifth century B.C. This art relies little upon drugs—"If physicians and the healing art were dependent upon drugs only, whether purgative or astringent, for the cure of diseases, my argument would be a poor one."[2] Nor does it profess to cure everything. On the contrary, incurable diseases are to be let alone. It makes no claim whatever to supernatural aids or inspired knowledge, and utterly ignores charms and amulets, but "clearly has, and ever will have, its essence in causation and the power of foretelling."[3] In other words, relying on the uniformity of causal sequence in nature, we can, from observation of like cases, foretell the probable sequence of events in diseases, and the modifications which may be produced by changes in diet and other agencies. The knowledge how to use these agencies to best advantage as to nature, quantity, time, etc., is knowledge of "the art" which has thereby gained and will continue to gain the most brilliant successes.

This earliest proclamation of "the gospel of inductive science," strikingly modern as it is both in its positive and negative aspects, is in complete harmony with the Hippocratic writings in general.[4] Throughout the collection there is the same subordination of drugs to dietetics and general hygiene, the same emphasis on the importance of prognosis and a knowledge of the natural

[1] *Op. cit.*, Introduction.

[2] Gomperz, 48. Kühn, i. 10, 11.

[3] *ἡ δε ἰατρικὴ καὶ ἐν τοῖσι διά τι καὶ ἐν τοῖσι προνοουμένοισι φαίνεταί τε καὶ φανεῖται ἀιεὶ οὐσίην ἔχουσα.* Kühn, i. 11.

[4] It seems not impossible that Hippocrates may have assisted Protagoras in composing his oration. Both tradition and the locality of several recorded cases bring the physician to Abdera, and the writer of the *περὶ τόπων* was apparently acquainted with though not the author of the *περὶ τέχνης*.

history of diseases, and the same exclusion of the supernatural and priestly element both from theory and practice.

This last point is of special interest, for we know that there existed in the fifth century B.C., besides the ordinary faith-cures assisted by charms and amulets, a widely spread and long-established method of cure by "incubation," or therapeutic dream-oracles, most of them in Asclepieia, or temples of Asclepius, with whose worship the Hippocratic writers as members of the Asclepiad Guild were at least formally connected.

We might have expected that an account of the medical art as practised in Greece in the fifth century would have mentioned this aspect as supplementing or opposing rational treatment, but the *περὶ τέχνης* contains no word on the subject. There are, says the speaker, some who ascribe cures to "spontaneity" or "chance," and he replies, in the language of a modern philosopher, that spontaneity as excluding "cause" when properly examined is a word without any meaning,[1] and that chance excludes purpose indeed but does not mean "uncaused." Other modes of cure are disregarded, apparently as being unworthy of notice.

And the case is the same throughout. These Asclepiadae, though they reverence the gods[2] and recommend piety, never once mention the name of Asclepius after the formal notice together with Apollo and other deities in "the Oath." Though the collection contains a treatise on

[1] *τὸ μὲν γὰρ αὐτόματον οὐδὲν φαίνεται ἐὸν ἐλεγχόμενον· πᾶν γὰρ τὸ γινόμενον διά τι εἰρίσκοιτ' ἂν γενόμενον καὶ ἐν τῷ διά τι τὸ αὐτόματον οὐ φαίνεται οὐσίην ἔχον οὐδεμίαν ἀλλ' ἢ ὄνομα.* Kühn, i. 11. Gomperz, *op. cit.*, 48.

[2] The nearest approach to a recognition of supernatural influences in disease is Kühn, i. 70, "Medicine inclines to do honour to the gods as concerning symptoms and sickness, and physicians give way before them since medical lore has no superabundance of power." But even here there is no mention of Asclepius, and the tone of the treatise (*περὶ εὐσχημοσύνης*) is, as Kühn says, "ab Hippocratis mente valde alienus."

dreams and their interpretation, there is no word about the therapeutic dream-oracle. Certain diviners are admitted to be skilled in predicting from dreams things about to happen to cities and individuals, but when they try to interpret dreams foreboding bodily affections they get hopelessly muddled owing to their ignorance of physiology, and for prophylaxis can only recommend prayer, which though "fitting and very good" is not of much use by itself.[1]

Diviners, indeed, come off badly in these treatises. Ignorant physicians who quarrel with one another and give contradictory advice are said to bring scandal on the art, "and almost make it resemble the art of divination, for this is how diviners act."[2]

While the god and the dream-oracle are thus ignored, the third element of the temple medicine, the votive offering, is referred to twice, each time in a spirit of opposition. One passage holds up to reprobation certain "cheating diviners" who persuade young women recovered from hysteria to dedicate their best dresses "and many other things" to Artemis, and hints that they had better use them to get married in.[3] In the other, the great Hippocrates himself, in the argument leading up to his famous thesis that all diseases are equally divine and equally natural, points out that richer offerings and more imposing homage do not save the wealthier Scythians from being specially liable to a strange disease due to their peculiar habits, thus suggesting the conclusion he perhaps thought it inadvisable to formulate more clearly that "the divine" cannot be induced to modify its natural uniform action in disease by any sacrifices or oblations.[4]

Freedom from superstition—ἀδεισιδαιμονίη—is a quality which should adorn the physician,[5] while the writer of the treatise on epilepsy declares that a skilful practitioner

[1] Kühn, ii. 2, 3. [2] Kühn, ii. 30. [3] Kühn, ii. 528.
[4] Kühn, i. 562. [5] Kühn, i. 70.

who knows how to modify "by diet" the moist, dry, hot or cold in man, and recognises the favourable "occasions," can cure even this disease "without purifications or charms, and all other such vulgarity."[1]

One form of superstition prevalent in ancient Greece has, not indeed a representation, but a striking parallel in "Hippocrates." The belief in lucky and unlucky days gives half its name to the great poem of Hesiod. Observation of the natural history of diseases gave rise to the doctrine of critical days,[2] a belief justified to a large extent, but exaggerated by the ancient physicians partly, perhaps, from an adaptation of the Pythagorean view of the mystic value of numbers, and partly by indirect influence from the popular beliefs. "Sometimes a day is a stepmother, sometimes a mother," says Hesiod, "therefore blessed is he who knows them, and he works his work unblamed of the immortals." "Some days are more important for the treatment of disease than others," so might we paraphrase many Hippocratic passages, "therefore he is the best physician who knows how to seize the opportunity, and he works his work assisted by nature."

This work, the Hippocratic treatment, consisted of dietetic, pharmaceutic and surgical divisions, of which the first is one of the special glories of Hippocrates. "Dietetic," he tells us, "has great power for healing in all cases of disease, for preserving health in those who are well and for bringing those who train into good condition."[3]

As regards the sick, it consists in placing them in surroundings most favourable for the action of the *vis medicatrix naturae,* which was supposed to express itself usually in a coction (πέψις) of the disordered humour or humours followed by separation and evacution of "the evil."

[1] Kühn, i. 615.
[2] For a definition of "crisis" in diseases see Kühn, ii. 386.
[3] Kühn, ii. 30.

The physician must suit the "diet" to the habits and constitution of the patient, and especially avoid disturbance through food, which should be for the most part fluid, especially πτισάνη—barley water or barley gruel varying in consistency with the stage and nature of the disease.

Fomentation or copious warm bathing is often of value as "softening" the body and favouring elimination, and even patients with acute lung disease are recommended to sleep in the open air.[1]

We find here a recognition of the importance of habit and environment, and a mixture of caution and boldness which have been admired in all ages and most fully appreciated in our own.

Drugs as used by Hippocrates are for the most part evacuants, φαρμακεύειν meaning usually "to purge,"[2] and the substances employed range in activity from hellebore and spurge to asses' milk, the drastic nature of the former exciting the respectful amazement even of mediaeval physicians.

The last Aphorism declares that knife and cautery are the final resorts of medicine, but we can only touch upon the Hippocratic surgery by mentioning the operation for empyema, which is frequently described and must have been commonly practised. It has met with the approval of eminent modern surgeons,[3] and we can, perhaps, say of it with more certainty than of any other part of the Hippocratic treatment that it must frequently have obviated the tendency to death.

The question as to the general result of ancient therapeutics is more difficult to answer. Distinguished physicians in our own day have sometimes given vent to pessimistic utterances, probably not intended to be

[1] Kühn, ii. 440.

[2] E.g. Kühn, ii. 75, 95; iii. 729, τὰ ὑπὲρ τῶν φρενῶν ὀδυνήματα ἄνω φαρμακείην σημαίνει· ὁκόσα δὲ κάτω, κάτω.

[3] Prof. Gerhardt, *Zur Geschichte des Brutstiches.* Berlin, 1890.

taken seriously, as to the worthlessness of medical treatment. They have, however, continued to practise, and to publish "successful cases." The Hippocratic writers pursue an opposite course. The great majority of their published "cases" end fatally, and the treatment given to those who recover is rarely considered worth mentioning. Their object, in fact, is not to record their successes but to give natural histories of disease. Yet at the same time their general utterances show a young, light-hearted optimism of the most refreshing character. Like their lay apologist, Protagoras, they have no doubt that the Art is real and achieves the most brilliant results. The principles of medicine are already fully discovered. It remains to apply them properly, and this can be done by those whose personal capacities and external circumstances are such as enable them to acquire the knowledge.[1]

Nor would it be easy to imagine principles which could have been applied in that age with better prospects of success than the hygienic and eliminative treatment briefly outlined above.

Even taking the least favourable side, some of the Hippocratic drugs have stood an empiric test of many centuries and survive both in popular and scientific use. Hyoscyamus recommended in quartans[2] reappears as hyoscyamine in one of the latest professional lists of anti-malarial remedies, while Cinquefoil (Potentilla reptans) which Hippocrates administered in tertians is still a popular remedy for ague throughout Europe. But in its next extant recommendation we find a significant change. Cinquefoil, according to Dioscorides, is a valuable remedy for tertians and quartans, but it is important to take three leaves in the former, and four in the latter disease, while the addition of an amulet

[1] Kühn, i. 16; ii. 148.

[2] Kühn, ii. 251.

consisting of three crushed spiders in a bag adds greatly to the efficacy of the remedy.[1]

This brings us back to the most striking aspect of the Hippocratic medicine, its pure naturalism. It is true that "naturalism" was from early times characteristic of the Hellenic mind. Even the wounded gods in the *Iliad* are healed by means, not by miracles, and their rapid recovery is attributed to the "natural" perfection of their tissues.[2] In the *Odyssey*, though diseases are attributed to gods or demons, and charms are used to stop bleeding, Circe like Medea is a foreigner, and Odysseus is confident that not even Poseidon can give his own Polyphemus a new eye[3]—a feat which afterwards became a favourite miracle in the Asclepieia. Aeschylus classes medicine as a natural art with agriculture and navigation, but then he connects it still more closely with divination,[4] and Pindar, though he has a poor opinion of Asclepius, has firm belief in charms and amulets.[5]

In short, the *Corpus Hippocraticum* represents a high-water mark of positive science even in the enlightened and rationalistic fifth century.

But an ebb followed rapidly. The "Epistles" which conclude the collection, though undoubtedly spurious, are of ancient (perhaps fourth century) date, and show an instructive contrast to the treatises we have been considering.

According to a legend which may reflect some truth, the people of Abdera sent for Hippocrates to attend their famous fellow-citizen Democritus, for supposed insanity, and the physician is represented as writing—before he saw the patient—to reassure a mutual friend, Philopoemen of Abdera. While thinking over the case he slept, and

[1] Ἐμπορικά, ii. 31.
[2] *Il.*, v. 900 ff.
[3] *Od.*, ix. 525.
[4] *Prometheus*, 475ff.; contrast the Hippocratic view of divination.
[5] *Pyth.* iii.

Asclepius appeared to him not "smiling and mild,"[1] as usually represented, but in an obviously bad temper, hurrying away from Abdera followed by hissing snakes and attendants with tightly closed medicine boxes. The physician besought his divine ancestor to stay and help him, but Asclepius replied that not he but another was needed, one divine even among gods. Then he saw a lady, tall and fair, in simple garments and with eyes like stars, who took him by the hand and led him to his guest-house at Abdera. There she left him, saying they would meet again at the house of Democritus. Her name, she said, was Truth, but the people of Abdera preferred another lady—who promptly appeared, also fair, but bolder and more strikingly dressed—whose name was Opinion. This clearly shows, says Hippocrates, that the people of Abdera imagine Democritus to be insane, though in truth he is not so; for complete reliance can be placed on dreams of this kind, medicine and divination being closely allied, since the father of both is Apollo, "also my ancestor," who foretells diseases and heals them.[2]

This is a very different view of the relation between medicine and divination from those quoted above, and reminds us of that of Aeschylus. But Aeschylus knows better; he knows that medicine and divination are gifts not of the Olympians, but of a son of the earth-born Titans, and modern mythologists confirm this. They tell us that Asclepius, the chief representative of the combination, was primitively an oracular earth-spirit; whether a heroized ancestral ghost, or an adjectival form of the great chthonian deity in his aspect of counsellor and healer it is difficult to say.[3] Moreover, he differed

[1] According to some etymologists the name Asclepius = shining and mild.

[2] Kühn, iii. 788ff.

[3] For this view of Asclepius see especially the articles in Roscher's *Lexikon*, i. 675ff, and Pauly-Wissowa's *Encyclopaedia*, ii. 1642ff.

from other earth-spirits and deified ancestors, whose shrines were their supposed tombs or some special locality (cave, spring, or vapour-vent), in the extreme mobility of his worship. This seems due in part to the fact that among his earliest worshippers were the Minyans, a mysterious clan of wealthy adventurers whom we find in early times all over Hellas. Their most famous seat was "wealthy Orchomenus" in Boeotia, but they dwelt also in Thessaly (Argonauts) and travelled westwards to Elis where in Homer's time was "the Minyan river,"[1] south to Laconia, and east to the islands of Melos and Thera, and the Ionian city Teos. In all these localities we find traces of the ancient worship of Asclepius.

An allied race, perhaps a branch of the Minyans, called Phlegyae, likewise dwelt in Thessaly and Boeotia, whence they colonised Phocis. They also worshipped Asclepius, and Phocis was "full of Asclepieia,"[2] foremost among them being that of Tithorea, where the bearded god was worshipped as Archegetes or divine founder "of all Phocis," long before the youthful Apollo slew the symbolic earth-serpent at Delphi and took possession of the ancient chthonian oracle. A contest ensued resulting in the degradation of the older deity and his conversion into a son of the younger, though he still retained his position as healer.

His prominence as physician comes out very clearly in Homer, though the purely human aspect there given to Asclepius has long misled mythologists. They now recognise that a poet who so humanised his own Olympian deities would have no difficulty in reducing the gods of other people still further, and that what happened to Asclepius is only one example of an important process in the development of Greek religion. The Olympian system was brought in by Achaean or

[1] *Iliad*, xi. 722.
[2] Pauly-Wissowa, ii. 1646.

Hellenic invaders from the north and superimposed upon an ancient Pelasgian theology[1] whose gods and demi-gods were degraded into men, and scandalous stories invented about them and their mothers.[2] But the worship of many of them persisted, and that of Asclepius underwent a marvellous restoration. A tradition of his original godhead seems to have continued throughout, for Pausanias[3] insists that Asclepius "was held to be a god from the first and did not merely acquire the reputation in course of time," and he appeals for confirmation of this to Homer,[4] of all persons. His argument is not very convincing[5] but he would hardly have arrived at the belief without other evidence, and had he gone to the next word he might have found some support even in Homer, for modern authorities tell us that the epithet "blameless" so strangely applied to such persons as Aegisthus, and Salmoneus, as well as to Asclepius, indicates something supernatural, and especially a degraded or non-recognised deity.[6]

The importance of all this for our present purpose is the evidence it affords that Asclepius was worshipped especially as a healing deity or oracle-giving earth-spirit from early times in many parts of Greece. Nothing is more natural than that men should sleep on the ground and seek advice in dreams from earth-spirits or deified ancestral ghosts, and we know that this "incubation" was practised at the shrines of other gods or demi-gods such as Trophonius and Amphiaraus, but it is a

[1] Cf. Harrison, *Religions of Ancient Greece* and *Prolegomena to the Study of Greek Religion.*

[2] E.g., the story of Coronis. Pindar, an Olympian κατ' ἐξοχήν, slanders Asclepius himself, declaring he lost his life through greed. *Pyth.*, iii.

[3] ii. 26.

[4] *Iliad*, iv. 193, 194.

[5] It seems based on the supposition that φῶτ' Ἀσκληπιοῦ υἱόν, "the mortal son of Asclepius," implies the immortality or deity of the latter.

[6] Harrison, *Prolegomena*, p. 447.

remarkable fact that the therapeutic dream-oracle is ignored in all extant Greek literature, medical or general, till the close of the fifth century.

Herodotus refers to incubation among the habits of certain African savages. "The Nasamones go to the tombs of their ancestors, and after praying lie down to sleep, and whatever dream they have they make use of it."[1] He also tells how Croesus and Mardonius consulted Amphiaraus, but he gives no hint of the existence of a therapeutic dream-oracle, and were it not for a line in the *Wasps* of Aristophanes[2] and a fragment of the historian Hippys of Rhegium we should have no reference to medical incubation in Greece earlier than the fourth century.

The most probable explanation seems to be that the custom belonged to the lower stratum of religious beliefs, that it was practically confined to the vulgar, and that cultured writers, medical or lay, disdained to notice it.

But towards the end of the fifth century a striking change occurs. The worship of Asclepius was introduced into Athens B.C. 420, and he thenceforth became more widely known and more highly honoured, finally developing into Zeus-Asclepius, the Saviour *κατ' ἐξοχήν* of Greek popular religion,[3] surviving all his fellow deities till we get a final glimpse of him about A.D. 450, when the philosopher Domninus, a Jew by faith, incubated in his temple and ate pork at his behest (!) a century after the establishment of Christianity.[4]

And this second period is also marked by a change of method. For the earlier time we have only the testimony of Aristophanes and the inscriptions recently discovered at Epidaurus—the 42 "Cures of Apollo and Asclepius" which form so amazing a contrast to the 42

[1] iv. 172.
[2] L. 123.
[3] Pauly-Wissowa's *Encyclopaedia,* ii. 1661-2.
[4] Suidas, *sub voce.*

clinical histories of Hippocrates. Their chief characteristics are the rapidity of the cures and the emphasis laid upon their theurgic character. "When day appeared, he went away healed," is the conclusion in nearly every case, and the cure is accomplished either by the god himself or through sacred dogs or snakes.[1]

The cases, indeed, are either impossible miracles, such as the birth of a five years old child, or the effects of suggestion exaggerated in the telling, *e.g.*, the instantaneous cures of blindness or paralysis, but both the early inscriptions[2] and the early accounts[3] indicate that the stay was short, and the cure represented as entirely supernatural.[4] It is difficult to conceive anything more entirely opposed to rational medicine or medical teaching.

In the second period, eminent persons "incubate" in the Asclepieia, some of them stay a considerable time, and the god now acts as consultant, giving oracles which are interpreted by the priests, the patient, or his physician. Thus Crantor, the philosopher, stayed so long in the temple of Asclepius that it was thought he would set up a school there,[5] while Aeschines the Rhetorician was treated for three months for a wound in his head.[6] So, too, the patient in Plautus' *Curculio* seems to have had not an immediate cure but advice which required interpretation. This change is still more apparent in inscriptions of the Roman period (*e.g.*, the

[1] The few cases of delay or partial failure are due either to some offence given to the god or over-hastiness of the "attendants" in trying to operate without divine aid.

[2] *Ephemeris Archaeologike*, 1883-5.

[3] Aristophanes, *Plutus*.

[4] That is, begun and completed by the god or his immediate agents. Contrast the forty-two Hippocratic cases, most of which end fatally, while hardly anything is said about treatment, the whole emphasis being laid on the natural process of the disease to death or recovery.

[5] Diog. Laert., iv. 24.

[6] Anthol. Palat., vi. 330.

later ones at Epidaurus) and the orations of Aelius Aristides, and here medical men carry out the instructions of the god.[1]

For there was a corresponding change in the relation between the lay and priestly medicine. We have seen that the Hippocratic writers will have nothing to do with the therapeutic dream-oracle, they will not even mention it, and when they mention "diviners" and votive offerings in connexion with disease it is only with contempt. Nor do we find medical men in temples of Asclepius in the fourth century; but after this the title "physician and priest of Asclepius" begins to occur, and, what is still more significant, medical men appear as attendants (ξάκοροι or ὑπουργοί) of the god.[2] In the Roman age physicians even founded Asclepieia and perhaps practised in them.

But this development of the temple medicine, by no means caused any diminution of lay practice. On the contrary, public medical officers, of whom we have some scanty notice in the sixth and fifth centuries,[3] now become a general institution throughout Hellas.[4] The medical profession was as it were established and endowed in the fourth century, and in some cases was supported by a special tax—τὸ ἰατρικόν—of which we have evidence as regards Teos and Delphi.[5]

The result, however, was no "endowment of research," but rather coincided with the collapse of the Hippocratic methods. The clinical histories and observations so characteristic of Hippocrates cease for two thousand

[1] Arist. *Orat.*, Dindorf, p. 477.

[2] The inscriptions are collected in Pohl, *De Graecorum medicis publicis*, pp. 14-16, 19, 47. The writer draws the same conclusion as that in the text, viz., that there was no connection between the lay and priestly medicine in the earlier time (fifth century), but that they became more harmonious afterwards.

[3] Democedes, Pittalus.

[4] "Quarto igitur seculo fere omnes omnino urbes Graecorum medicos publice conduxisse censendae sunt." Pohl, *op. cit.*, p. 22.

[5] Pohl, p. 73.

years, and are replaced by "Cures" magical or rational. Even Galen uses amulets, and despite his admiration for his great predecessor tells stories of patients mainly in order to show how much better his "Cures" were than those of other people, nor does the scientific method of Hippocrates reappear till we come to the "Observationes" of the sixteenth century.

In place of it we have a return to the pre-Hippocratic system, a subordination of everything to the discovery of something which "may do good," whether it be tortoise blood or crocodile dung—remedies approved by the Empiric school—or crushed spiders and green jasper stones hung round the neck, as recommended respectively by Dioscorides and Galen. In short, there was a fresh development of that reliance on simples and superstition, so vast a collection of which has been handed down to us in the *Natural History* of Pliny the Elder.

To sum up, we find at the end of the fifth century a rapid development and spread of the therapeutic dream-oracle, now recognised by the educated and afterwards by medical men, a conversion of the Asclepieia into health resorts[1] as well as places of supernatural medical aid, while the supernatural itself is diluted with as much medical treatment as consisted with maintenance of the essential theurgic basis. This coincides with a cessation of scientific medical progress and a substitution of "Cures" for clinical histories and observations. Physicians no longer look upon charms and "purifications" as vulgarity (*βαναυσία*) but themselves adopt such

[1] The building of the great theatre of Polyclitus at Epidaurus seems an indication and result of this change. A striking example of the recognition of the dream-oracle by educated men in the fourth century is the commission of Euxenippus "and two other wealthy Athenians" to "incubate" in the temple of Amphiaraus at Oropus and report their dreams in order to settle a disputed land question. See Hyperides *Oration for Euxenippus.*

methods. In short, therapeutics tend to revert to the ancient mixture of religion, magic, and empiricism.

There were, of course, exceptions to this degeneration, and medicine, like other sciences, progressed in some departments under the fostering care of the Ptolemies at Alexandria, but that the post-Hippocratic period was marked by a loss of the scientific spirit, and a failure to carry on a brilliant beginning, especially in therapeutics, seems indisputable, nor has any satisfactory explanation yet been given.

Such an explanation would be afforded by the increase and spread of a disease against which rational medicine was at a disadvantage as compared with religion, magic and empiricism, and such a disease is malaria.

Now-a-days the treatment of malaria represents one of the greatest triumphs of medical science. To quote an eminent authority, " He who sees a physician at this work knows not whether to admire more the precision of microscopic technique which has shown the malarial parasite in the red blood corpuscles, or the skill and perseverance of those who have traced its life history in man and the mosquito, and determined the phase in which it is most vulnerable to quinine. Each day the physician places a drop of the patient's blood under the microscope till he sees the parasite in that stage of development in which the drug will destroy it. No more purely scientific achievement than this can be imagined."[1]

But the ancients had neither quinine nor microscopes. They had not even " bark," which our ancestors used to " throw in " with such vigour; and even our ancestors sometimes found that while by throwing in bark they had only produced extreme nausea, quacks and laymen had accomplished wonderful cures by other methods.

Chief among these were rest, change of air, vehement mental emotion, strong impressions on the imagination, or even an implicitly relied upon suggestion. Sir

[1] E. von Bergmann, *Erste ärtzliche Hülfe.* Berlin, 1903, p. 3.

Thomas Watson tells us in his *Lectures* that his own grandmother was famous for curing agues, "and all she did was to assure the poor people who came to be relieved that they should have no more of it after a certain day." [1] That fear or excitement will act as a cure has long been known, probably even before Q. Fabius Maximus was healed of a quartan by one of these agencies during a battle, as recorded in Pliny's *Natural History*.[2]

According to Marchiafava and Bignami, "spontaneous cure" is observed not only in mild fevers, that is to say quartan and especially the tertian, but also in fevers of the aestivo-autumnal group, though not in "pernicious malaria," and the main factors in spontaneous cure are rest, change, and wholesome food and drink. But these recoveries even when frequently repeated do not confer immunity or prevent re-infections "with all their train of consequences up to a state of chronic infection and cachexia." [3]

Now, while "pernicious" cases would not be able to go to the temples, persons with milder forms of malaria would find there a combination of the above therapeutic agents, and many cures would doubtless take place to the encouragement of sufferers from other diseases and the greater glory of the dream-oracle. These "cures," however, while fostering superstition and helping to bring about the remarkable modifications in the history of therapeutics which we have attempted to describe, would not be genuine cures of malaria and would have little influence as checks upon the gradual but sure weakening of national spirit and efficiency which the disease tends to bring about.

The malaria theory also helps to explain a remarkable development in the history of Greek religion. In the

[1] i. 815. 1871 edit.
[2] vii. 50.
[3] Twentieth Century Medicine, xix. 446.

sixth century there had been a partial revival of the old Pelasgic worship, but the cult of the chthonian god of healing was kept in the background for some time longer by the prestige of the secular guild of the Asclepiadae. This derived its name from Homeric sources, took the Homeric view of Asclepius, was Olympian in worship and rationalistic in practice. But just as "the fear and sense of sin produced especially by the calamities of the sixth century" caused a re-emergence of Pelasgian Orphism, purifications, Dionysus-Zagreus worship, etc.,[1] so the spread of malaria seems to have brought forward once more the ancient Minyan earth-spirit with his therapeutic dream-oracle, which received thence-forward higher and wider recognition, till Zeus-Asclepius Σωτὴρ τῶν ὅλων seemed at one time a possible rival of the Saviour God of Christianity.[2]

[1] Harrison, *Religion of Ancient Greece*, 1905, p. 65.

[2] For Asclepius as Ζεὺς Ἀσκληπιός and Σωτὴρ τῶν ὅλων see Pauly-Wissowa, ii. 1661, and for the prominence of his worship in the last age of Paganism, Boissier, *La Fin du Paganisme*, i., 117, 118.

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